


# Wleń/Lähn District in the Sudetes Foothills, Poland: A Case Study of Cultural Landscape Evolution of an East Central European Settlement Microregion From the Tenth to the Eighteenth Centuries

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**Abstract** The aim of the study is to reconstruct the evolution of the cultural landscape of a settlement microregion located in Central-Eastern Europe, in the Sudetes Foothills. The microregion selected for the research, Wleń, is a good example to study and describe phenomena that are also typical of other similar administrative and economic territories in this cultural zone during the medieval period and the modern era. Archaeological evidence, written and cartographic sources, Airborne Laser Scanning, Geographical Information System and geomagnetic research were used to reconstruct the development and forms of particular elements of the settlement and the economic structure.

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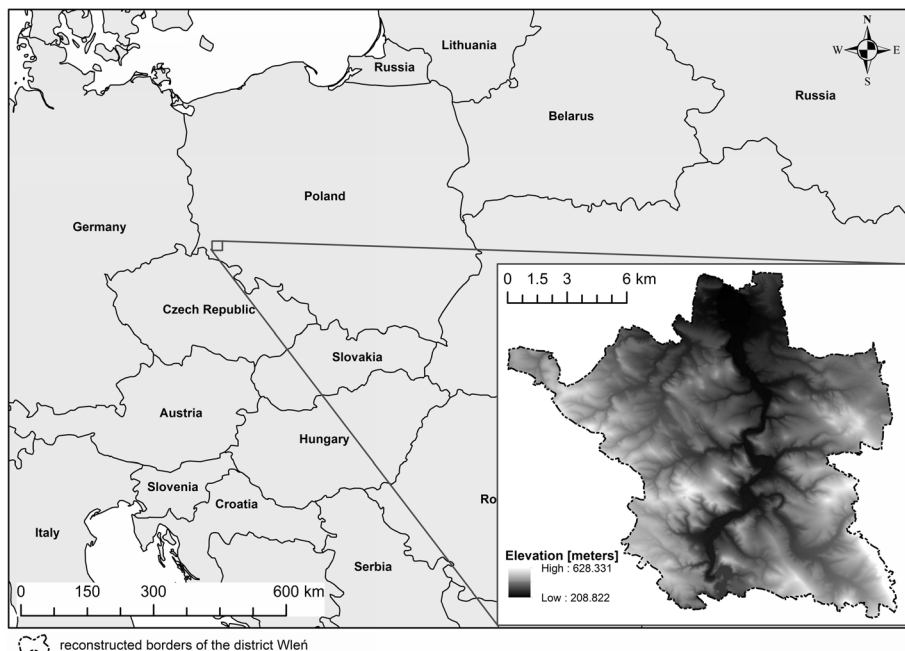
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## Introduction

The Wleń microregion developed as a result of complex settlement, economic and social processes that took place on the border of various cultural zones and were connected with the changing political structures of Poland, the Czech state and Germany. It is located in East Central Europe, in the upland southern part of Silesia (Fig. 1). This particular settlement complex was chosen as a case study because of the significant role that it played in the Middle Ages. It used to function as a local central town, however, neighboring bigger towns gradually took over its position. Nevertheless, Wleń has retained its unusual character, conditioned by the rich history. It is a model example of a coherent settlement microregion in this part of Europe and the current state of research allows for an attempt to prepare a comprehensive study. The aim of this paper is to analyze the course and conditions of historical evolution of the Wleń microregion in the pre-industrial era.

Particular elements of the studied complex appeared in different periods of time and conditions, reflecting contemporary settlement and economic tendencies as well as legal situation. Development of the settlement structure began in the tenth century when a stronghold with an adjacent settlement on Góra Zamkowa in Wleń, on the left bank of the Bóbr River, was founded. It was mentioned in the bulla of Pope Adrian IV issued in 1155 as one of the centers that mark the southern border of the diocese of



**Fig. 1** Location of Wleń district. (Prepared by A. Luczak)

Wrocław (KDS 1951–64, vol. 1, no. 35). It is assumed to have been the central place of one of the stronghold districts—the oldest local form of administrative division of the early Polish state. The stronghold was radically rebuilt and transformed into a stone castle in the early thirteenth century at the latest. During the time of *Ostsiedlung* (or German colonization), when Henry I the Bearded was Duke of Silesia, the town of Wleń was founded by the river at the foot of Góra Zamkowa. A network of villages in its close neighborhood also appeared. In the late Middle Ages the former stronghold district was transformed into an administrative unit referred to as *Weichbild* or *Districtus*, terms that were typical of German medieval legal system. The structure became a basis for modern Wleń (German *Lähn*) county that has its own historical and cultural identity (Knoblich 1863; Patschowsky 1925).

Knowledge about the structure of the settlement complex and its transformations was until now based on the results of historical and archaeological research performed using traditional methods. Attention was focused on the medieval castle, especially its highest, most elite part where Romanesque buildings were discovered (Buśko et al. 1990, 1991, 1992, 1993, 1994, 1996; Chorowska et al. 2009, s. 235–256; Jaworski et al. 2012; Marek and Piekalski 2005; Piekalski and Wysocka 2000, 2001). Early dating of the new type of fortified residence, unfamiliar in the contemporary Polish State yet typical of the feudal Europe, provoked an intense debate on the beginning of castles in Poland (Boguszewicz 1998, 2001, 2010, pp. 61, 164–166; Buśko 1998; Buśko and Michniewicz 2006; Chorowska 2003, pp. 52–55, 2008, pp. 68–74; Chorowska et al. 2009; Czechowicz 1998; Kajzer et al. 2003, pp. 13–34, 541–543; Michniewicz et al. 2007; Mruczek 2005; Rozpędowski 1999). Other elements of the structure remained unnoticed in the discussion, possibly due to methodological constraints. Presently, widely available non-invasive survey techniques, based on the possibilities of Airborne Laser Scanning (ALS) and Geographical Information Systems (GIS), as well as interdisciplinary cooperation brought new opportunities. They allowed to break the impasse and examine Wleń district from a different perspective. Nevertheless, earlier achievements are not in principle questioned or diminished. The most important is to complement them by expanding the spectrum of the research, as well as performing an analysis of the transformation's conditions, causes and effects. We set new research questions and tried to prepare a comprehensive answer.

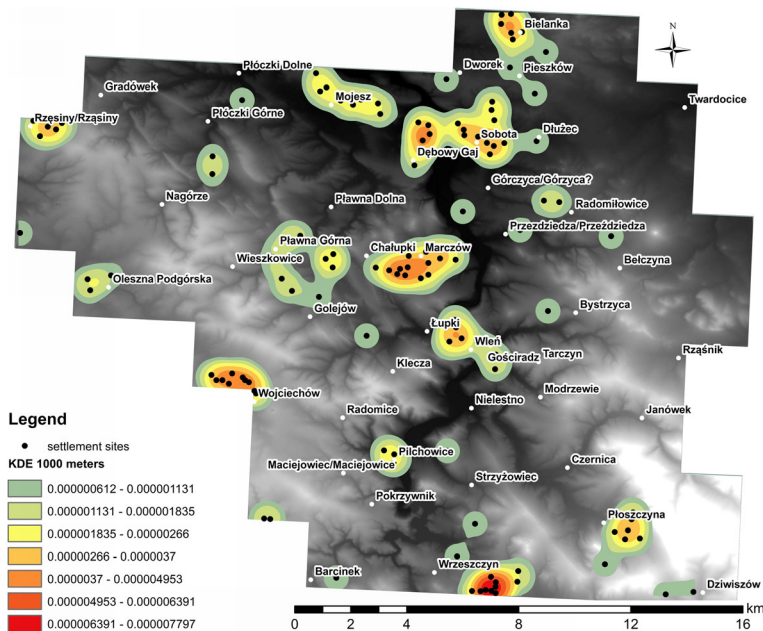
The analysis of natural conditions focused on the study of settlement preferences that are possible to observe. By means of the results of archaeological excavations and non-invasive survey the transformation process of the microregion's central place located on Góra Zamkowa in Wleń could have been reconstructed. However, the original thirteenth - century spatial arrangement of the town of Wleń was never properly studied. Its hypothetical reconstruction was based on a retrospective study of cartographic sources. Next, analysis of the district's area in the late Middle Ages, its settlement structure and mining activities, was carried out. Also, the results of the research significantly enriched our knowledge of border marking stones. Their localization and diversification allow for an attempt to reconstruct administrative and proprietary boundaries in the area. A GIS-based spatial analysis enabled a reconstruction of the road network, which was later verified by historical cartographic sources. The earlier excavation of the gallows and the execution site at Modrzewie village by Wleń were complemented by a gallows visibility analysis and the study of their significance to the cultural landscape of the whole district.

## Analysis of the Settlement Sites Location Pattern

The Wleń microregion is situated in southwestern Poland, in the western part of the Sudetes, on the border of two mesoregions—Pogórze Izerskie (Izera Mountains Foothills) and Pogórze Kaczawskie (Kaczawskie Mountains Foothills)—that are separated in the north–south direction by the Bóbr river (Kondracki 1981, p. 383). Its reconstructed maximum surface area measures 18185.89 km<sup>2</sup>. The area is extremely upland with numerous culminations with the height up to 628.331 m above sea level. The Bóbr river, as well as its tributaries, are typical mountain rivers.

The area of 391.075 km<sup>2</sup>, chosen for the study of settlement preferences in the researched territory, reaches slightly beyond the reconstructed borders of the *Weichbild*. It encompasses over 200 archaeological sites of different categories that date back to the Middle Ages and the early modern period. The categories are: settlement traces that indicate penetration of the area without permanent settlement (60 sites), settlements (67), strongholds (eight), inhumation cemetery (one), castles (seven), border stones and markers (46), ore mines (22), gallows (two), conciliation crosses (two), dyke (one), bridge fragments (one). Settlements, settlement traces and castles were taken into account in the study. They are spread across the area irregularly, however, they concentrate in the vicinity of the town and castle of Wleń, as well as in the neighborhood of villages Siedlęcín, Dębowy Gaj, Sobota, Bielanka, Wojcieszów, and Płoszczyna (Fig. 2).

The evaluation of settlement preferences was carried out on the basis of GIS software's utility in spatial development analysis (Łuczak and Gruszka 2012, pp. 16–18). The analysis was supported by a Digital Elevation Model (DEM) with the raster cell resolution of 5 x 5 m, which was created by smoothing and changing the resolution



**Fig. 2** Wleń district. Density distribution of archaeological sites within 1 km. (Prepared by A. Łuczak)

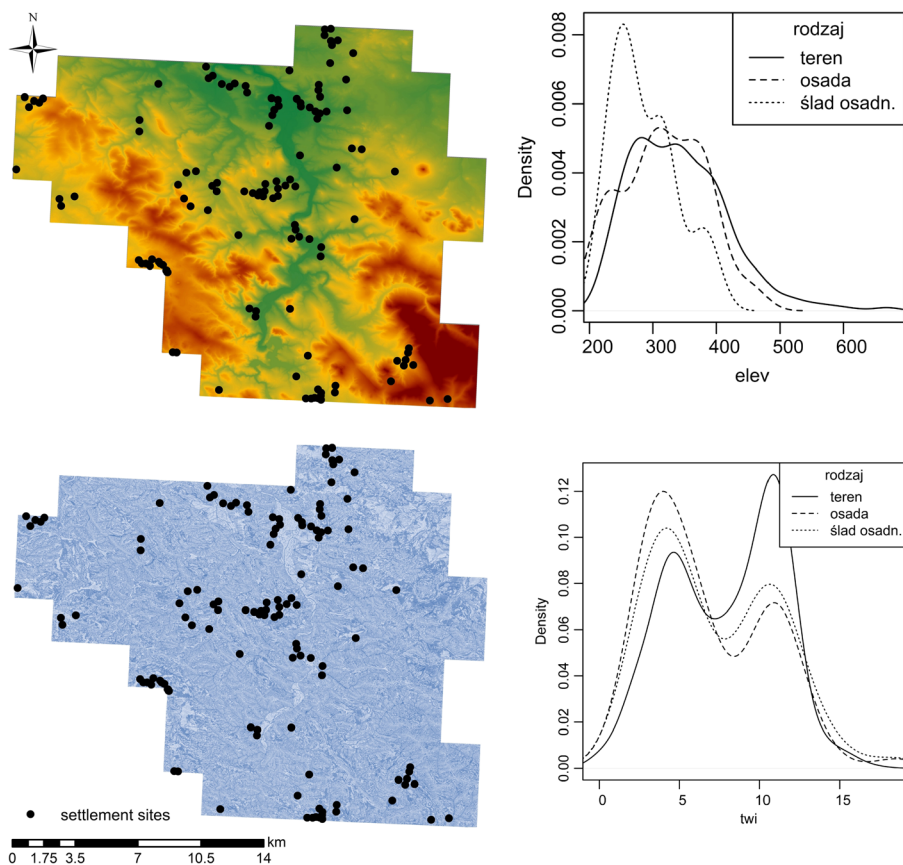


of the DEM obtained during ALS measurements to  $1 \times 1$  m. Information on the hydrographic network was collected from the DEM and the results were compared with archival maps from the first half of the twentieth century (*Messtischblätter 1880–1940*). By means of the gathered data, we created maps representing seven morphometric parameters, including two main topographic attributes: elevation and slope as well as four secondary terrain attributes: insolation (valid for December 22), Topographic Wetness Index (TWI), slope length factor (LS, referred to as sediment transport capacity index) and vertical distance which is measured from the watercourse surface (Jasiewicz and Hildebrandt-Radke 2009a; Łuczak and Gruszka 2012, pp. 17–18, 26, Table 2; Urbański 2010, pp. 152–169). Socio-economic aspects were also considered, however, due to very scarce information on the early medieval settlement, they were limited to two factors only: the distance from watercourses (1st – 5th order streams) and the distance from strongholds. A variable that describes vertical distance might be also regarded as a cultural factor, as it may indicate naturally defensible locations (Jasiewicz and Hildebrandt-Radke 2009b, pp. 2099–2100).

The information collected on natural and cultural conditions was subjected to a statistical analysis. The aim was to determine the relationships between environmental and cultural factors and to define settlement location preferences.

Additionally, a logistic regression model was used in the analysis. It helped to identify environmental and cultural factors that could affect the location of medieval and modern settlements in the studied area.

Location of the sites in reference to elevation in meters above sea level suggests that areas situated relatively low were preferred (Fig. 3). The figures for settlements vary between 200–230 and 290–400 m above sea level. There is a larger variation in the case of settlement traces—between 200 and 700 m above sea level. The analysis of slope angle preferences indicates similar relationships. For settlements, sites with low angle up to  $10^\circ$  were preferred and the settlement traces were recorded in the areas with the angle of  $10^\circ$ – $20^\circ$ . The results definitely confirm the upland character of the researched area. It is hard to determine whether insolation was an important factor when it comes to settlement location preferences in the region, since archaeological sites are concentrated in the areas where average insolation of  $0.4$ – $0.8$  kWh/m<sup>2</sup> dominates. The relationship between the settlement density distribution and the wetness index (Fig. 3b) clearly indicates that low index of 0–6 was preferred in the case of both settlements and settlement traces. The figures suggest that areas which supported vegetation and where the ground was stable were preferably chosen. Another studied index, LS (the sediment transport capacity index), describing ground stability and erosion susceptibility reflects a similar connection. Archaeological sites are located where the LS index is low and varies from 0 to 5, however, such figures dominate in the researched region, in general, and affect the reliability of the results. Considering the vertical distance measured from the watercourse surface, for both settlements and settlement traces the height of 0–20 m above the watercourse surface was preferred. The analysis of the distance from sites to watercourses brought interesting results. Both types were usually located 100–300 m from the first-order streams. The average distance from second-order streams was up to 400 m for settlements and up to 600 m for settlement traces, while the distance from third-order streams was up to two km for both types of settlements. Regarding fourth-order streams, the preferred distance was up to three km and more than seven km for settlements and between four



**Fig. 3** Wleń district. a – the location of sites with reference to elevation above sea level, b – the settlement density in relation to the wetness index. (Prepared by A. Łuczak)

and seven km for settlement traces. In the case of fifth-order streams it was up to one km for settlements and up to four km for settlement traces. The last analyzed factor—the distance between archaeological sites and fortifications—shows evident regularity. Settlements were located no further than four km from such places, which means 1 hour of walking one way on average. Settlement traces are usually discovered more than four km away from strongholds.

To sum up the results of the analysis, it is worth noting that some environmental factors turned out to be statistically significant for the location of archaeological sites (Table 1). Also, cultural factors—the distance from watercourses and the distance from strongholds—proved to be crucial concerning settlement location preferences.

## Reconstruction of Forms of Settlements on Góra Zamkowa in Wleń

Wleń is a functional center of the surrounding microregion. Thanks to archaeological research, the past settlement structures on Góra Zamkowa were relatively well recognized. The attention was focused on the fortified residence (Fig. 4) and its transformations from the

**Table 1** Results of the logistic regression model for environmental factors of the archaeological sites locations

	Estimate	Std. error	z value	Pr( $\geq z $ )
<b>Elevation</b>	−9.053e-03	2.251e-03	−4.022	<b>5.76e-05 ***</b>
<b>Slope</b>	−9.615e-02	2.638e-02	−3.644	<b>0.000268 ***</b>
<b>TWI</b>	−6.410e-02	2.921e-02	−2.195	<b>0.028196 *</b>
<b>3th order streams</b>	3.482e-04	1.231e-04	2.828	<b>0.004683 **</b>
<b>4th order streams</b>	3.439e-04	7.340e-05	4.686	<b>2.79e-06 ***</b>
<b>5th order streams</b>	−1.202e-04	4.500e-05	−2.670	<b>0.007587 **</b>
<b>Distance to fortifications</b>	−2.987e-04	5.963e-05	−5.009	<b>5.48e-07 ***</b>

Only the most statistically significant (with  $p < 0.05$ ) factors are presented p value is shown in bold; significance codes are presented under the table

Significance codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

early Middle Ages to The Thirty Year's War. The archaeological evidence that was recorded during excavations aroused much interest and provoked a lively discussion. One of the most significant elements of the discussion was the aforementioned problem of the beginning of castles in Silesia and Poland.

Fragments of ceramic vessels that date back to the tenth–eleventh centuries were found on the top of Góra Zamkowa. Unfortunately, their relation to the oldest fortifications—a similarly dated stronghold—is unknown. Nevertheless, it seems certain that the culmination of the hill was exploited since the time the area was settled. It was probably due to its natural defensibility. The eastern part of the hilltop is, to a large



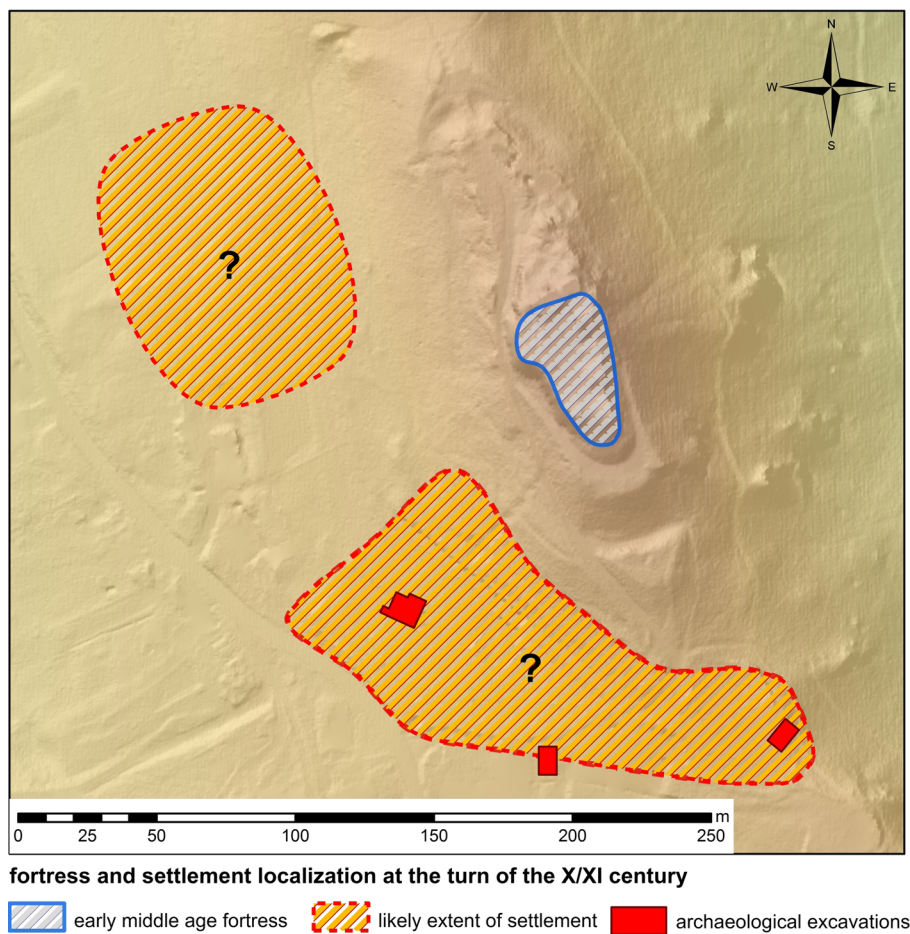
**Fig. 4** Wleń. Fragment of the castle remains. (Photo by J. Piekalski)



extent, a steep precipice which did not need to be strongly fortified, regarding the medieval warfare. The western slope is more gentle and does not provide any natural barrier.

A settlement connected with the oldest stronghold was located in a well insulated area of a gentle slope, situated to the south and southwest from the hill top (Fig. 5). The maximum distance between tenth century finds indicate that the settlement was at least 100 m long in the north–south direction and at least 150 m long in the east–west direction (Buśko et al. 1994, pp. 436–440; Marek and Piekalski 2005, p. 162). The southern border was reconstructed by means of archaeological field survey, including subsurface testing and the eastern one is formed by the ridge of Góra Zamkowa and its steep slope's edge. Not much is known about the western and the northern border of the settlement. The attempts to solve the problem included fieldwalking and geomagnetic prospection, however, the results were not clear.

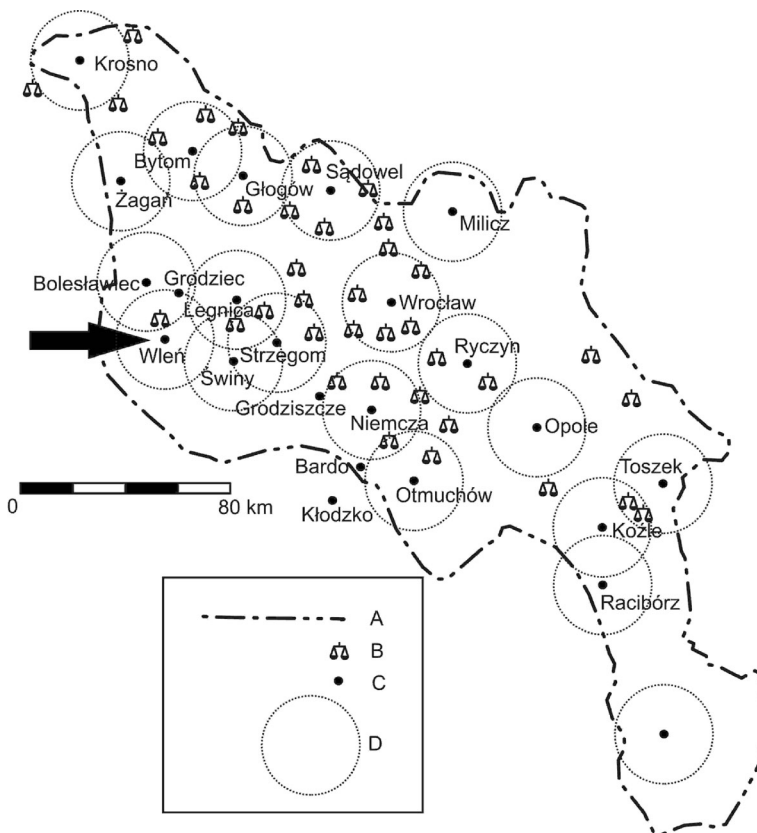
Finds that date back to the twelfth century were spread across the hilltop, encompassing the whole area that was later occupied by the stone castle (Buśko



**Fig. 5** Wleń, Góra Zamkowa. Location of the oldest stronghold with the adjacent settlement. (Prepared by A. Łuczak and J. Piekalski)

et al. 1990, pp. 288–290, 1991, p. 257, 1993, p. 370, 1994, p. 342, 1996, pp. 281–286; Piekalski and Wysocka 2000, pp. 219–223). This proves that the whole area of the later castle, 130 m long and stretched in the north–south direction, was at that time settled. The settlement was possibly fortified, which is indicated by the discovery of fortification relics at two different sites (Chorowska et al. 2008, p. 311). The bulla of Pope Adrian IV from the year 1155 does not clearly define the status of Wleń (KDS 1951–64). On the basis of archeological evidence and literary sources we might assume that in the tenth–twelfth centuries on Góra Zamkowa functioned a stronghold that can be identified with the border point *Valan*, mentioned in the bulla. We agree with the opinion present in the literature that the stronghold was a central place of a stronghold district (Fig. 6). Such districts, at least from the early thirteenth century defined as castellanies, were basic administrative units of the early Polish State (Gawlas 2000, pp. 74–75; Modzelewski 1975, pp. 92–135; Moździoch 1990, pp. 46–47).

In the late twelfth century the stronghold began to gradually transform into a stone castle. In the highest part appeared a Romanesque residential building, followed by a chapel, a stone curtain wall and a *Bergfried*. We associate St. Mary's church, consecrated no later than 1169 and described as being located *ante castrum Len* (...) with a village that functioned

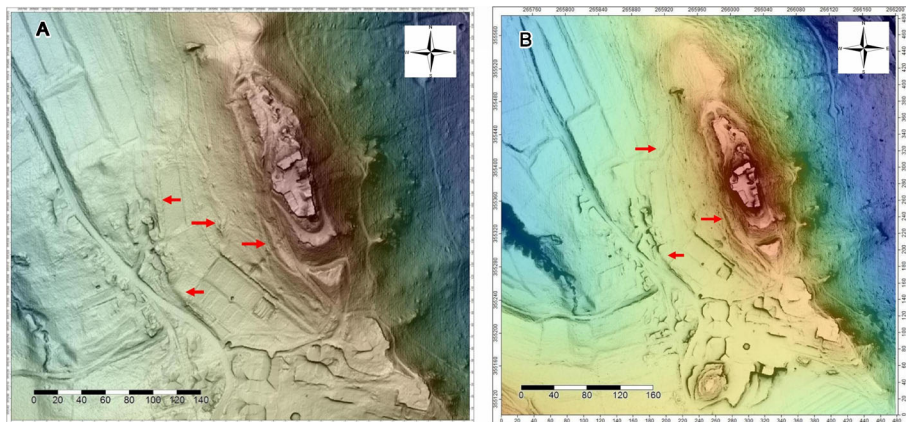


**Fig. 6** Silesia in the eleventh–twelfth centuries. Network of central places: (a) – province borders, (b) – secondary centers, (c) – castellan strongholds (primary centers), (d) – hypothetical area of the stronghold economic area. (Prepared by the authors after Moździoch 1994)

near the castle (Chorowska et al. 2008, pp. 307–309, 315; Mruczek 2005). Other parts of the castle—the middle castle and the lower castle—existed during the period as well. Fortifications consisted of a moat and an earth-and-stone rampart. The Romanesque castle was owned by the Silesian line of the Piast dynasty who ruled the province during the fragmentation period. On behalf of the duke, a *castellanus* who earlier controlled a stronghold district, administrated the castle (Goliński 1989). In the course of further political changes and progressive feudal fragmentation, the castle was first part of the Duchy of Legnica, later of the Duchy of Jawor-Świdnica and in the 1370s it became a knight's property (Fig. 7). Significant architectural development and transformations of the buildings and fortifications took place in the late Middle Ages and the early modern period. The castle finally ceased to function during the Thirty Years' War (Buśko et al. 1991, pp. 244–249). It had been destroyed in 1646 and was not reconstructed. The new owner, Adam von Kuelhaus, in the year 1653 started the erection of a palace which was typical of the period and accordant with the contemporary artistic trends. The new baroque residence was built approximately 90 m from the old castle. It occupied the gentle southern slope that does not provide natural defensibility. At the same time, the medieval St. Mary's church was replaced by the baroque church of St. Hedwig. Thus, a new architectural complex, present in the cultural landscape of Wleń until now, was created.

The nearby village was located on the southwestern slope of the hill and its relics were confirmed by archaeological excavations (Jaworski 2009). The results indicate that it was moved further from the castle than the earlier settlement that accompanied the stronghold. In the earlier phases of the Middle Ages it neighbored the fortified hilltop. In the late Middle Ages and the early modern period the distance from the castle was at least 90 m. The transformation might be associated with the changes in defense techniques and clearing the area around the castle, conditioned by the quick development of artillery.

Further information on the development of the settlement and fortifications on Góra Zamkowa is provided by a DEM analysis. The data was collected during laser scanning (LiDAR) and it was used to try to precise the location of the early medieval stronghold's fortifications. Unfortunately, changes that were driven by the agricultural activity on the



**Fig. 7** The Wleń castle. Relics of masonry buildings. Anomalies that were marked with *arrows* are supposedly connected with the relics of fortifications from different periods and require verification. (Prepared by M. Legut-Pintal)

western slope of Góra Zamkowa as well as the erection of the residential complex in its southern part caused some difficulties. Nevertheless, the DEM obtained from the  $0.5 \times 0.5$  m raster cell LiDAR measurements indicates sites that should be archaeologically verified (Fig. 7).

## Original Spatial Arrangement of the Town of Wleń

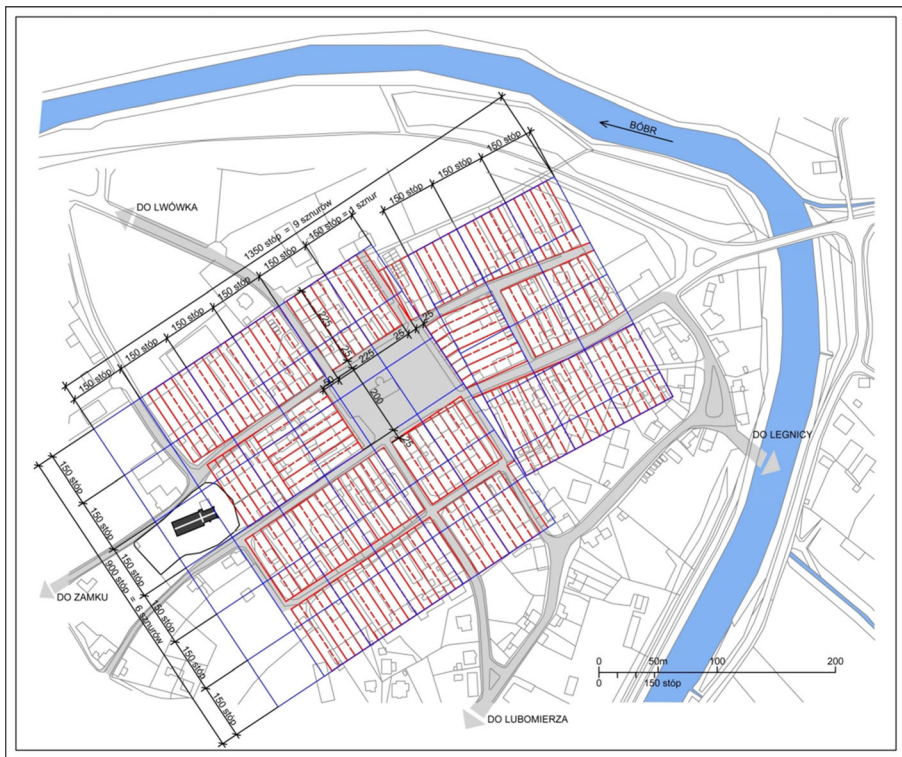
The town was founded in the vicinity of the castle, at the eastern foot of Góra Zamkowa, in the area of a wide meander of the Bóbr river. It was first mentioned in 1261 in reference to Marcin, the town headman (*Vogt*) of Wleń (SUB 1963, vol. 3, no. 362). According to tradition, supported by the local researchers, the town was established in 1214 (Knoblich 1863, pp. 17–19) on the land without any pre-existing settlement. The layout was rectilinear, formed into a shape of a rectangle which was 375–376 m long and 280 m wide. The size of the rectangular market square, situated in the centre of the structure, was  $102 \text{ m} \times 77 \text{ m}$ . The parish church was erected on a small elevation close to the western town boundary. Even though it was located quite far from the market square (a whole one block of buildings, which is approximately 120 m), its situation delineated an axis that goes through the centre of the market square and the whole structure. The town was planned so regularly, especially in the western part where the market square is, that it encouraged us to try to find a unit of length that could have been used during the demarcation process as well as the multiples of surface modules that were utilized to establish the original measurement pattern. Because of the lack of archaeological excavations, analysis of the layout of the present-day town, supported by relatively young cartographic sources, is the only possible way to try to reconstruct its early spatial arrangement.

In the thirteenth century, two linear length systems were used in Silesia: the older one where a unit equaled 31.3 cm and was based on the Rhenish foot, and the younger one, based on the Chełmno foot, where a unit equaled 28.8 cm (Stamm 1936, pp. 7–9). In order to determine which scheme was used in Wleń, basic measurements of the contemporary town plan were recalculated using both systems.

Table II. Basic measurements of the town of Wleń in meters and feet in both systems (31.3 cm and 28.8 cm). All figures given in meters are taken from the elementary map, or *Grundkarte*, of Wleń at a scale of 1:500, shared by PODGiK. Prepared by M. Chorowska.

The analysis of basic distances that can be measured with the use of the town plan, recalculated using the historic linear length systems, suggest that the Rhenish foot was used for the demarcation of Wleń. The size of the rectangle, in which the densely built-up part of the town was contained, was  $1200 \times 900$  ft. The outcome can be recalculated into full multiples of a rope (in Polish *sznur*) that equals 150 ft, which gives the size  $8 \times 6$  ropes. The rectangular market square is 325 Rhenish feet long and 250 ft wide. The width of blocks of the buildings seems to eventually answer the question on the metric system that was used in Wleń, as it equals 240 Rhenish feet or 260 Chełmno feet. The width of 240 ft was popular in Silesia, especially in the oldest towns. Blocks 260 ft wide would have been an exception. The length of the market square frontages—approximately 200 Rhenish feet in the case of the western and eastern frontages and approximately 250 ft in the case of the southern frontage—were multiplied 50-ft modules, while the width of the main street equaled 25 ft (Fig. 8).





**Fig. 8** The town of Wleń. Hypothetical reconstruction of the historical plan. (Prepared by M. Chorowska)

The way to reconstruct the original size of building plots is a metric analysis of widths of fronts of the houses with the use of historic metric systems. The houses located at the market square, the oldest ones in the town, are the most appropriate for this purpose. Most houses in Wleń were built in the first and second quarter of the nineteenth century. These were masonry buildings with the ridge facing the market square. They replaced earlier timber houses and were being erected, inhabited and demolished for around 700 years, which is long enough to change or at least blur the original plot boundaries. Research on building plots in numerous Silesian towns showed that the boundaries eventually became set when massive walls between neighboring plots were built. The most frequent changes included splitting the plots in two or three smaller parts and moving the boundary of about two feet, which was legal in the Middle Ages. To eliminate mistakes, the widths of the particular plots need to be added up with the widths of neighboring plots. In Wleń, twenty-nine market square houses were analyzed and the result is that three individual houses and as many as eleven pairs of neighboring houses were approximately 50 Rhenish feet wide. The outcome leaves no doubt that the width of a full-size primary building plot in Wleń equaled 50 ft and the width of a half-size secondary building plot was 25 ft. Considering the present state of the research on parcellation of incorporated towns in Silesia, it is now impossible to state if in Wleń both types of plots, primary (50-feet) and secondary (25-feet) ones, or only half-size (25-feet) plots were used. Such plots have not been identified in the metric analysis of parcellation of incorporated Silesian towns

so far. The necessity to introduce 25-foot wide plots in Wleń might have been caused by a specific half-module shift in the location of streets that go from the market square southwards (in the direction of Lwówek) and northwards (in the direction of Lubomierz). The shift was not a result of a mistake or accidental alteration of the street axis. Almost certainly, it was created intentionally. Similar solutions are known from other Silesian towns incorporated in the mid-thirteenth century, such as Głogów, Dzierżoniów, and Plac Nowy Targ (New Market Square) in Wrocław (Chorowska 2010, pp. 138, 450, fig. VI).

Studies on Silesian towns founded in the thirteenth century indicate that the 50-foot module was based on a rope which was 150 ft long and therefore marked out three building plots (Chorowska 2010, p. 131). This connection might be noticed in Wleń as well. The size of the rectangular main part of the town was  $1200 \times 900$  ft, which equals  $8 \times 6$  ropes. The surface area of the rectangle would be 48 square ropes, which is, in turn, a little more than a half of a lesser Flemish lan (lan = 90 square ropes). The core of incorporated Głogów, consisting of the market square and blocks of buildings, had the same surface of  $8 \times 6$  ropes. St. Nicolas parish church was located in the area of the additional seventh rope (Chorowska 2010, p. 450, fig. VI). It was quite similar in Wleń where the parish church was situated outside the strictly built-up area, in the strip of the ninth rope. Other examples of towns where the surface area equals  $9 \times 6$  ropes are Kąty Wrocławskie or Namysłów. This was the surface typical of a middle-size Lower Silesian town.

The length of the building plots in Wleń was 225 ft. They were disproportionately long, in comparison to the building plots in Wrocław – 120 ft, Legnica – 120 ft, Namysłów – 120 ft, Głogów and Strzelin – 125 ft each, Jelenia Góra – 100 ft. It is possible that they were also intended for additional quasi-agricultural activities. The specific location of the church, outside the parcelled area yet in a significant place, almost on the town's axis, is also known from other early structures, such as Złotoryja, Lwówek, Środa Śląska, or Sobótka. Moreover, in Środa Śląska, Złotoryja, and Lwówek the size of plots was similar as in Wleń, however, in Sobótka, which should be treated as a typical rural incorporation, the church was situated in the middle of the central square. Considering the present state of knowledge, it is impossible to prove that the same solution as in Sobótka was used in Wleń. Nevertheless, low density of buildings in the block between the market square and the church might indicate that the assumption is correct. Also, in all other cases the half-module shift in the situation of the side streets took place in the middle of the market square, not in the corners, like now in Wleń. If we assume that initially the block between the market square and the church was empty, the shift in the streets location would be situated more or less in the middle of a long rectangular square. Such market squares are known from some early Silesian towns, like Złotoryja, Lwówek, and Nowogrodzic.

## Projected Reconstruction of the Borders of Wleń District

Late Medieval Wleń was the central place of an administrative unit referred to as *Weichbild* or *Districtus*. However, its exact territory is not precisely known. Political and administrative borders within Silesia frequently changed from the early Middle Ages to the administrative reform of 1938–45, that is why it is so difficult to reconstruct the divisions. The issue is widely discussed in the literature (Nowakowski

2009; Orzechowski 1971a, 1971b). Such terms as *districtus*, *pertinentia*, *territorium* or *terra*, referring to administrative units appeared in the literary sources in the second half of the thirteenth century. In the fourteenth century, these names were replaced by their German equivalents: *Weichbild*, *Zugehörung*, *Herrschaft*, and *Land*. The necessity to replace the former administrative organization, based on castellanies, with the new one was caused by the development of the feudal system, allocating lands to church institutions and to the chivalry as well as colonization, including incorporation of villages and towns by granting them a German town law charter. *Weichbilds* played an economic and juridical role as juridical districts with the seat of a ducal representative (Nowakowski 2009, pp. 263–278, Wiszewski 2013; Zientara 1973, pp. 686–687). In the literature, the dominate opinion is that incorporated towns usually became central places of Silesian *Weichbilds*, however, sometimes a castle, referred to as *Burgweichbild*, could have gained such a function. Further territorial divisions took place between the fourteenth and the sixteenth centuries. These were mainly corrections to the original organization of *Weichbilds* and some of them were incorporated by the others (Pauk and Wólkiewicz 2013). This also happened to the researched Wleń *Weichbild* which, alongside Gryfów *Weichbild*, became an integral part of Lwówek *Weichbild* (Pauk and Wólkiewicz 2013; Wiszewski 2013). Even though the studied area was not an autonomous administrative unit since the fifteenth century, its former borders are still crucial for reconstruction of the social and cultural landscape of the district. The castle and the town of Wleń functioned as a local center between Jelenia Góra in the South and Lwówek in the north and were very important for their historical microregion.

The analysis and reconstruction of the reach and borders of *Weichbilds* are performed on the basis of literary and archival cartographic sources. Unfortunately, the latter usually come from later periods and may show the image of the territories that could have been highly modified, especially in terms of political and administrative borders.

The former Wleń castellany with the center in the aforementioned castle was transformed into Wleń *Weichbild*. The area was a part of a larger structure, the Duchy of Jawor that between 1274 and 1277 was singled out from the Duchy of Legnica, established in 1248. Around the year 1291, under Bolko I the Strict, the Duchy of Jawor was joined with the Duchy of Świdnica. It belonged to the Silesian Piast dynasty until the death of Bolko II the Small in 1368. Since the death of widow Agnieszka in 1392, the territory was ruled by Bohemian kings, and since 1526 by the Austrian Habsburg dynasty.

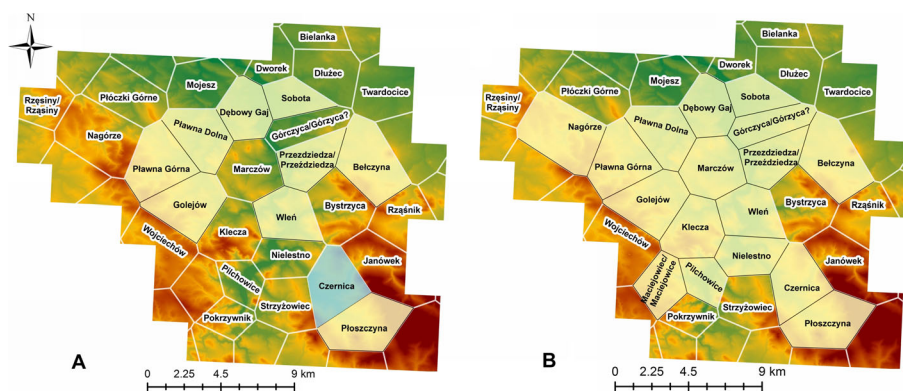
Some significant information on the beginnings of Wleń district is provided by *Liber fundationis episcopatus Vratislaviensis* from the early fourteenth century (LFEV 1889, pp. 113–140). According to the book, the Duchy of Jawor was divided into seven districts, named after their central towns: Jelenia Góra, Lwówek Śląski, Bolesławiec, Gryfów, Świerzawa, and Jawor. Wleń district consisted of the town Wleń and several villages: Belczyna, Czernica, Dębowy Gaj, Golejów, Pławna, Płoszczyna, Przeździeca and Sobota (Fig. 9a; LFEV 1889, p. 126). In the later sources from 1366 to 1376 to 1385 to 1407, mostly containing documents connected with property transactions, there is information in which district a town or a village was located (Landbuch 2004–07). The number of locations that belonged to Wleń district significantly increased, giving a more comprehensive picture of its territory. The district encompassed the town Wleń and the following villages: Nagórze, Pławna (Górna and Dolna), Dębowy Gaj, Sobota, Górzycza,

Przeździeża, Bełczyna, Marczów, Golejów, Klecza, Maciejowiec, Pilchowice, Nieleśno, Czernica, and Płoszczyna (Fig. 9b). Some of the villages were sometimes marked as belonging to neighboring districts. Dębowy Gaj is a good example, as it is described as a part of Wleń district in the documents from 1380, 1386 (IV), 1390 (I), 1397 (VII), 1399 (I, XI) and 1400 (XII). Nevertheless, according to the documents from 1385 (IV), 1393 (XII), 1395 (IV), 1396 (X), 1398 (XI) the village belongs to Lwówek district (Landbuch 2004–07, II, pp. 8, 15, 48, 147, 236, 262, III, pp. 41, 73, 104, 118–119, 143, 171–172, 228).

To determine hypothetical reach of Wleń district, we used Site Catchment Analysis, based on the Thiessen polygon method (Conolly and Lake 2006, pp. 212–213). The locations mentioned in the literary sources were taken into account. The received boundary lines were compared with those in later cartographic sources. Additionally, the areas and borders of particular urban and rural locations were reconstructed by means of Cost Distance Analysis based on the Tobler hiking function (Tobler 1993).

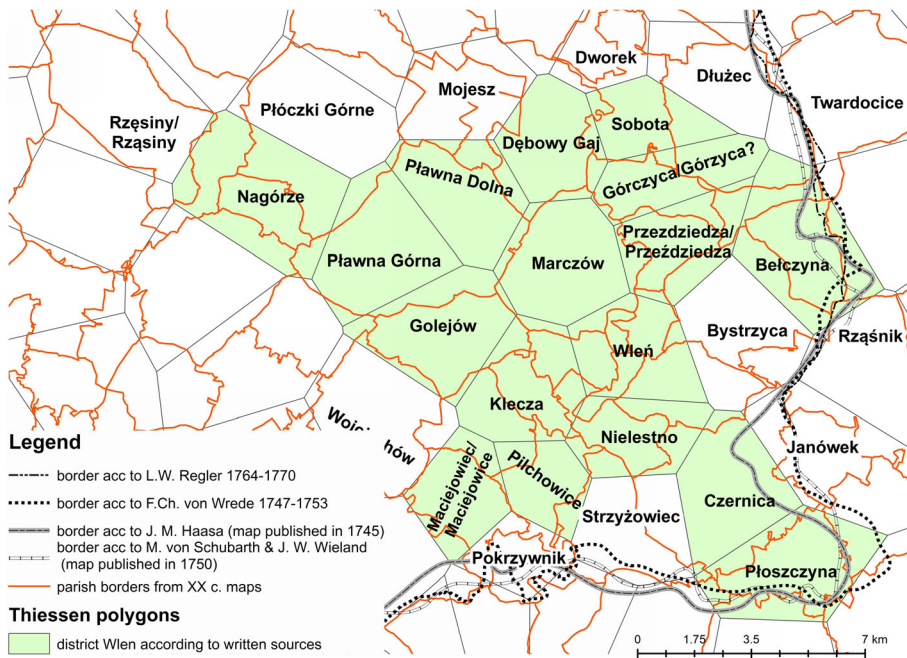
The picture of structure of Wleń *Weichbild* and its area that was acquired during the study of *Liber fundationis* (LFEV 1889) and the analysis of the theoretical reach of the town based on Thiessen polygons might be regarded as incomplete. The main reason is the specificity of the literary source which mentions only towns and villages that were obliged to pay the tithe. The situation of villages that, according to other sources, existed in the Wleń microregion as early as the thirteenth century remains unclear. They might have been in private hands at the time when *Liber Fundationis* was being written, or they were not autonomous territorial units and belonged to other villages. This was the case with villages Strzyżowiec and Pokrzywnik. There was a similar situation with Bystrzyca, a village with a church, known since 1217. It was a part of *feudum* called Stary Folwark Wleński (*die alten Vollwerk Vlan* in German) which encompassed the neighboring villages as well (Knoblich 1863, pp. 232–233; Regesten 1886, 191, pp. 118–119).

The available written sources, combined with the Thiessen polygons, allowed for a reconstruction of southern and western borders of the district in the medieval period. The southern border was defined by the areas of the following villages (counting from the South): Maciejowiec, Pokrzywnik, Strzyżowiec, and Płoszczyna. The western border was, in turn, defined by Czernica, Bystrzyca, Bełczyna, and Górzycza (Fig. 10). Such shape of the



**Fig. 9** Wleń district. (a) – the location and hypothetical area of the village in the early fourteenth century, (b) – the location and hypothetical area of the village in the second half of the fourteenth century. (Prepared by A. Łuczak)





**Fig. 10** Wleń district. Reconstruction of the late medieval borders. (Prepared by A. Łuczak)

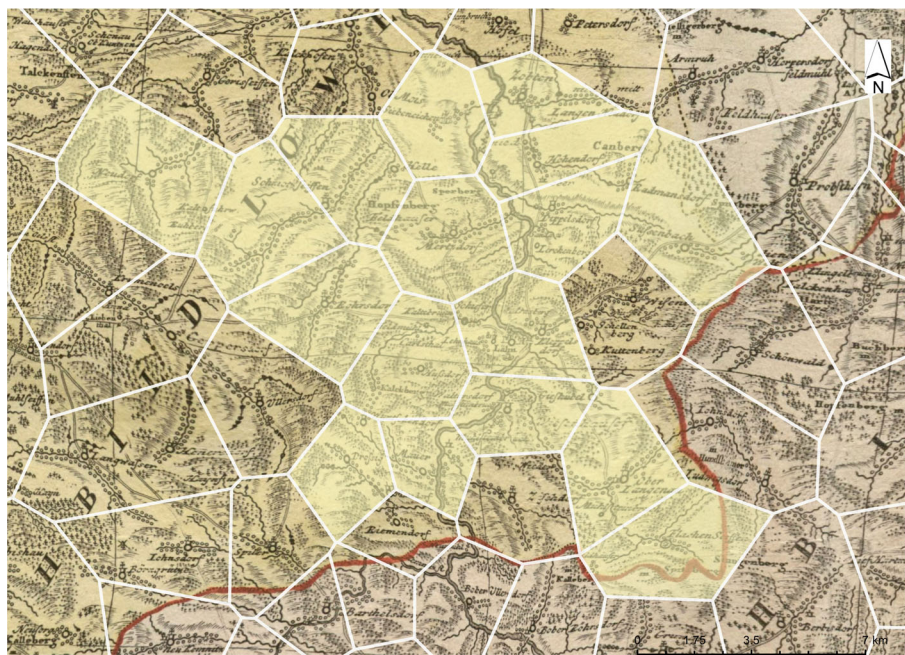
boundary is confirmed by the later small scale maps from the eighteenth century and precisely measured borderlines from the medium scale maps from the first half of the twentieth century. Thanks to GIS software, including georeferencing of raster images that are inaccurate, it became possible to use such sources in our research (Affek 2012). The first studied map (Fig. 11) was published in 1745, already after the death of its author, Johann Matthias Haas (*Ducatus Silesiae tabula* 1745). It showed borders of *Weichbilds* that existed at the time when the map was being prepared. The projected border of Wleń *Weichbild* partially comprised southern and western borders of Lwówek *Weichbild*. Even a preliminary analysis of the map allows noticing that it concurs to a large extent with the borders of the Thiessen polygons. Another map, prepared by Wieland-Schubarth (*Princip. Silesiae Iavoriensis* 1736) (Fig. 12) is a few years older than the previous one. It precisely shows the southern and western borders (Konias 1995) which appear to be very similar to those in the accurate topographic map issued in the first half of the twentieth century (*Messtischblätter* 1880–1940).

The map by Friedrich Khünovius, published in 1697 (*Ducatus Silesiae Iauranus*, 1697) has a lower research value. It contains serious measurement mistakes and some of the locations are marked in the wrong place. Medium scale maps by Christian Friedrich von Wrede from 1747 to 1753 (*von Schlesien* 1747–53, Kart N 15 060) and Ludwig Wilhelm Regler from 1764 to 1770 also include numerous simplifications (*Schlesien* 1764–70, Kart N 15 140), that makes them less valuable for our analysis.

The reconstruction of the western and northern borders that separated Wleń *Weichbild* and Lwówek *Weichbild* was based on Thiessen polygons as well as the study of the borders depicted on the twentieth-century *Messtischblatt* maps. The results were compared with the literary sources. Unfortunately, the older cartographic sources do not provide any



**Fig. 11** Wleń district. Comparison of theoretical borders of the settlements and the J. M. Haas's map from the year 1745. The borders of the district are depicted as a *dotted line*. (Prepared by A. Łuczak)



**Fig. 12** Wleń district. Comparison of theoretical borders of the settlements and the Wieland-Schubarth's map from the year 1736. (Prepared by A. Łuczak)



information on this issue. According to the written sources, the northern border was defined by the property that belonged to the following villages: Nagórze, Pławna (Górna and Dolna), Dębowy Gaj, and Sobota. In the case of the western border these were areas of Nagórze, Pławna Dolna, Golejów, Klecza, and the western part of the territory of Maciejowiec (LFEV 1889, p. 126). The areas that neighbored all mentioned villages in their entirety belonged to Lwówek *Weichbild*. The shape of the borders might be reconstructed with the help of *Messtischblatt* maps that can generally reflect the situation from the Middle Ages (Fig. 13).

## Analysis of the Cultural Landscape of Wleń District Using ALS Data and the Results of Geomagnetometric Survey

The area that was subjected to the ALS analysis encompassed the projected territory of Wleń district and its closest neighborhood. The aim of the study was to identify new archaeological sites that are visible in the landscape, especially those located in the areas covered with forests, inaccessible for surface survey yet available for a DEM analysis. Special attention was paid to the places where mining and processing of mineral resources took place – relics of mining fields related to gold and ore mining, placer mining traces and quarries. We also expected to gain more knowledge on already known villages, strongholds, and castles by investigating their neighborhoods in a wider context.

Analytical hillshading applied to a grid model with 30–40 % transparency was chosen as a basic form of visualization of the digital model. The second form of visualization were contour elevation plans, with the contour intervals adjusted to the specificity of particular

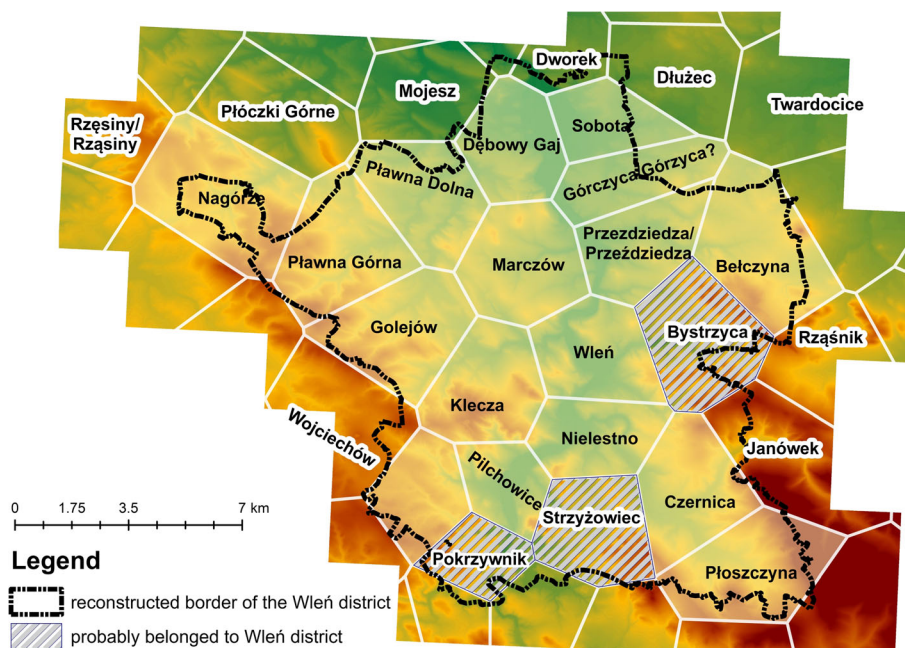
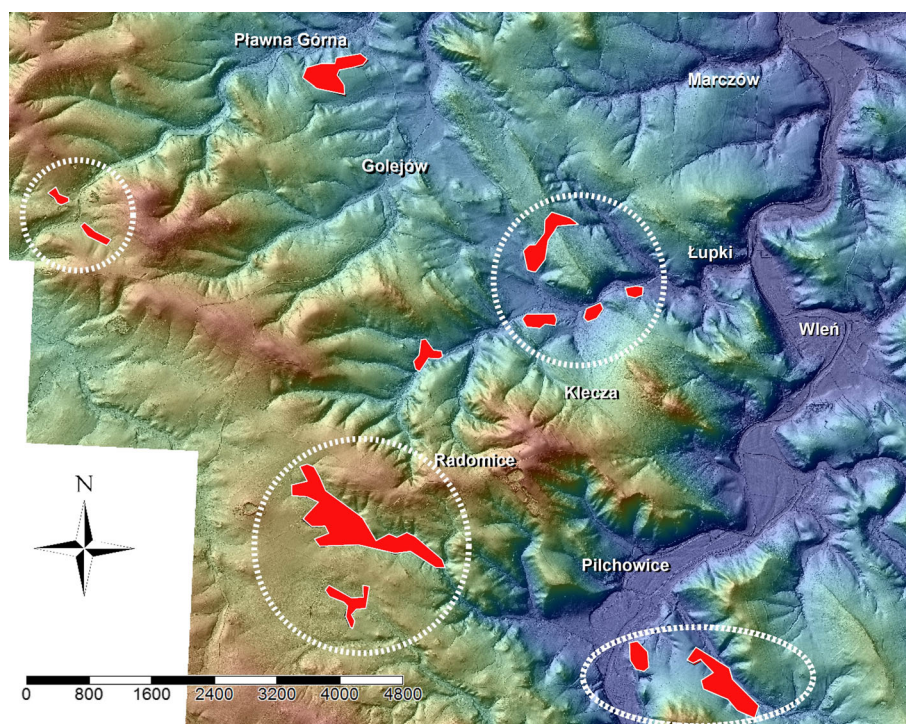


Fig. 13 Reconstructed thirteenth-fourteenth century border. (Prepared by A. Łuczak)



sites (0.2–0.5 m). For selected sites profiles were created and additional analyses were performed (e.g., using slope and sky view factor functions).

According to a Polish State Geology Institute report, bedrock gold deposits present in the area located to the west of Wleń, especially in the vicinity of villages Klecza and Radomice, might be possibly extracted in the future (Raport 2010, pp. 10–11). The area had not been archaeologically surveyed until our research project was carried out. A DEM analysis allowed identification of mining traces. A number of sites with the surface area ranging from a few hectares up to several dozens of hectares were discovered. They were mostly located on the western bank of the Bóbr river, in the Iżera Mountains Foothills. Open-pit mining sites, relics of mining shafts and heaps of output in the river valleys that are remains of placer mining might have been connected with medieval and early modern gold mining activity. The largest concentration was found in the area of Radomice Hills, in the stream valleys (Fig. 14). Placer gold mining sites, where gravel containing gold grades was processed, were identified on the north-western and the western side of the massif, along the Jamna stream, on the grounds that belong to the villages Golejów, Klecza (Fig. 15), and Łupki. Large sites, possibly connected with placer gold mining also existed in the southern part of the Radomice Hills, in Radomice and Maciejowice. Three sites were identified in the valley of the Srebrna stream that runs through the village called Pławna. A few sites that might be related to gold deposits extraction were recorded on the right bank of the Bóbr river. In the area of Pilchowice and Strzyżowice poorly preserved traces of roads and heaps of output were also discovered. Their connection with gold mining requires verification through geological research and their chronology might be established only during a future



**Fig. 14** Location of mining sites. (Prepared by M. Legut-Pintal)



**Fig. 15** Klecza, st. 1. Mining field, (a) – the DEM, (b) – contour plan. (Prepared by M. Legut-Pintal)

archaeological study. Nevertheless, it seems possible that the beginnings of the medieval colonization in the area could have been connected with the discovery of alluvial gold deposits in the neighborhood of Wleń.

Exploitation of rock played a significant role in the microregion's economy. Two sites that possibly date back to the pre-industrial era are located at a short distance from Wleń, on the land belonging to Łupki village. The first site was connected with exploitation of basalt and encompasses two small peaks of a hill (Fig. 16). There is a strong likelihood that the material extracted at this quarry could have been used for construction of the Wleń castle and the buildings related to the manor house situated at its foot. The second quarry is located northwest of Łupki, on a steep slope descending to the valley of the Jamna stream, near the place where it flows to the Bóbr river. The early dating of the pit is also indicated by its characteristic funnel-like shape.

In the microregion, a significant number of pond relics in the form of dykes, located mostly in the areas close to springs of small streams, were discovered. Some of them could have been used during the process of placer gold extracting and serve as sedimentation basins. The others might have been functioning as fish farms. Unfortunately, during a DEM (Digital Elevation Model) analysis we cannot determine the time when these devices were built. Their chronology may range from the Middle Ages until the nineteenth century.

The DEM analysis allowed discovering two new potential fortified objects. A hypothetical stronghold is located north of Dębowy Gaj village. Considering military aspects, its situation on a sandstone cape that cuts into a terrace of the Bóbr river valley is highly attractive. The hill has the shape of a triangle, with circular exposition and the size of 160 x 200 m. In the northern, eastern and southern parts there are steep ridges



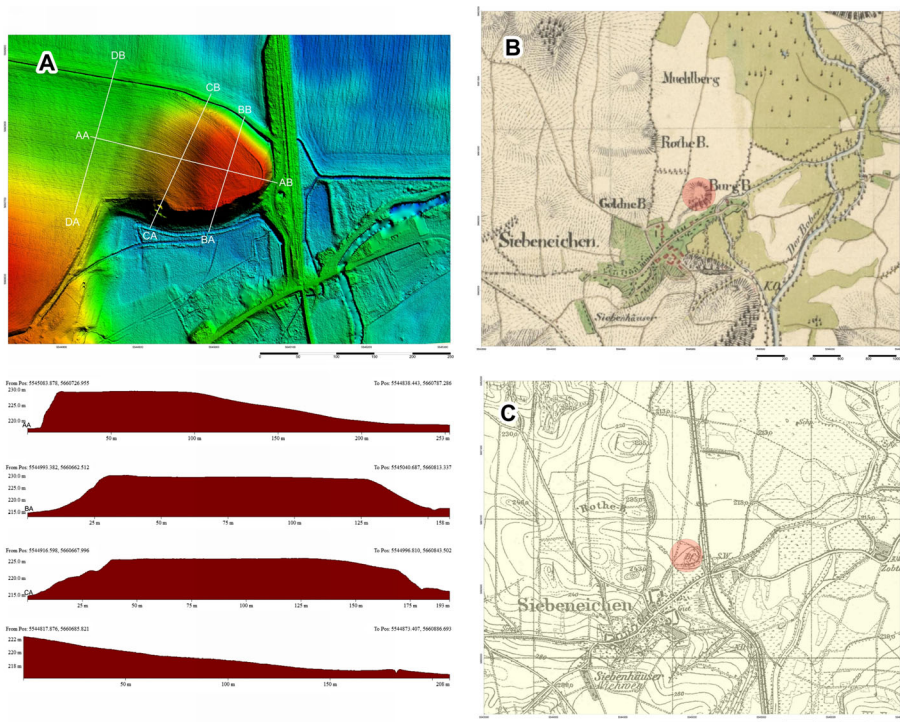


**Fig. 16** Basalt open-pit mining site in Lupki, the DEM. (Prepared by M. Legut-Pintal)

12–14 m high, descending in the direction of the bottom of the Bóbr river valley. A gentle slope that provides access to the top is located in the eastern part. The top of the hill is a flat, triangle-shaped plateau with the sides 60–70 m long and the surface area of around 6000 m<sup>2</sup>. Within the area anomalies that might be relics of moats were discovered. The defensive function of the object is confirmed by an archival map from the nineteenth century (*Urmesstischblatt*, Kart N 729, 2883, Liebenthal) where it had been marked as “Burg B.” (Góra Zamkowa, Fig. 17). The hill was not built-up at that time. On a map which is 100 years younger the name “Burg B.” does not appear, however, the area is still free of buildings (*Messtischblätter* 1880–1940).

Information provided by cartographic sources and the DEM analysis was combined with the results of the geomagnetometric survey that covered the surface of 0.51 ha. The alterations in the magnetic field were depicted using greyscale. The obtained results suggest that an unknown fortified object existed. It used the natural defensibility of the cape and consisted of three moats and either a rampart or a masonry wall as well as some architectural elements, possibly a tower and other wooden or masonry buildings (Fig. 18). Sparse fragments of ceramic vessels collected from the surface are generally dated to prehistory and the Middle Ages.

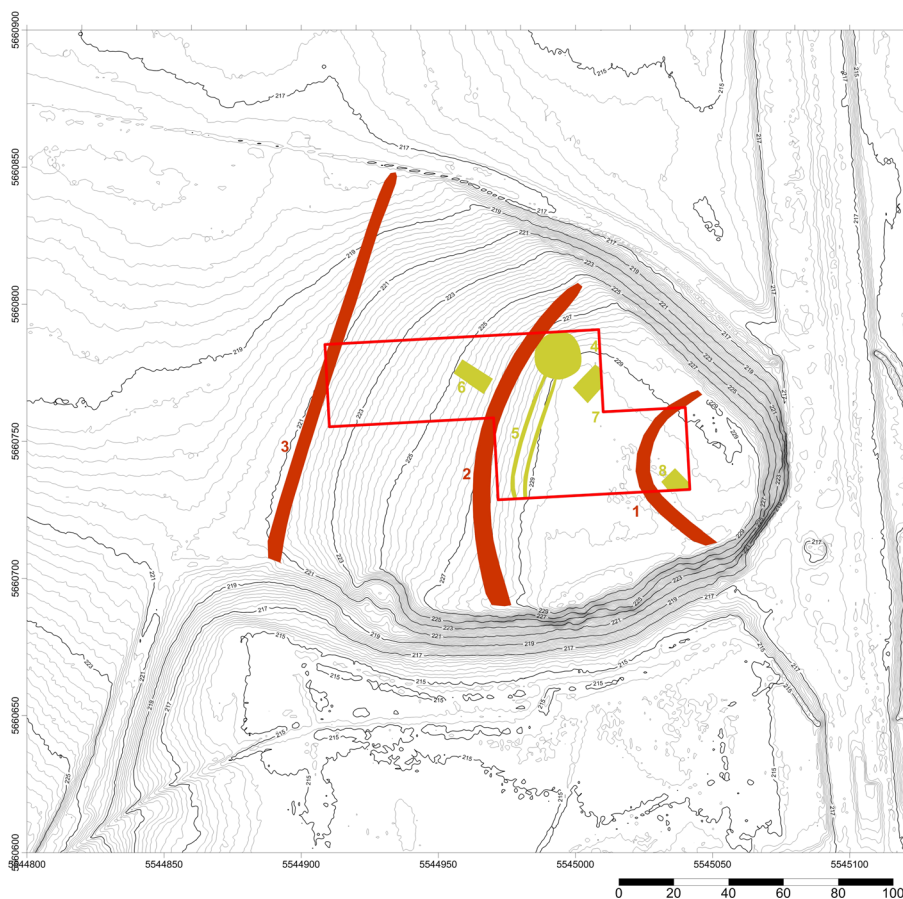
The second stronghold, located on the top of Grodowa Góra in Nielestno, in a meander of the Chróśnicki Potok, was identified thanks to ALS data. The hill is naturally defensible and from the east, north, and west protected by steep slopes descending to the stream valley. On the top there are two rock formations in the form of platforms. Their original shape was altered during the process of extracting sandstone, which took place in the quarries located along the sides of the formations. In the southwestern part of the larger



**Fig. 17** Dębowy Gaj, stan. 7, Lwówek Śląski county, (a) – the cross-section of the outlier on which the site is located, (b) – the archival map from the early nineteenth century (Urnesstischblatt), (c) – the archival map from the early twentieth century (Messtischblatt). (Prepared by M. Furmanek)

platform, poorly preserved relics of a rampart approximately 25 m long are visible (Fig. 19). Defining the significance of both fortified objects help to expand our knowledge of the landscape of the microregion in the Middle Ages. They join the already known stronghold in Marczów and castles in Płoszczyna and Pirszyn, however, they all were less significant than the castle Wleń that functioned as the central place.

Within the Wleń microregion four sites that might be defined as modern field fortifications were discovered. The most interesting ones are located on the margins of the studied area, on a hill called Skalnik that belongs to Oleszna Podgórska village. On the peaks of the massif, set in the direction east–west, two objects were found. They can be identified as trapezoid field forts with convex front parts. In the neighborhood of the forts there is also a system of trenches. Small field fortification in quadrilateral form, fortified with a rampart from three sides (battery), was recorded on a hill located over Pławna Górna village. It was accompanied by trenches, however, chronological relation between the trenches and the fortification remains unknown (Fig. 20). Possible relics of a field camp were identified at Płóczki Dolne. A rectangular object (30 x 40 m), surrounded by a low rampart, is located on a hill that lies by a road which connects Pławna Dolna and Mojesz. Establishing the chronology of these fortifications requires additional studies. They might have been connected either with Silesian wars from 1740 to 1745 or the Napoleonic wars.



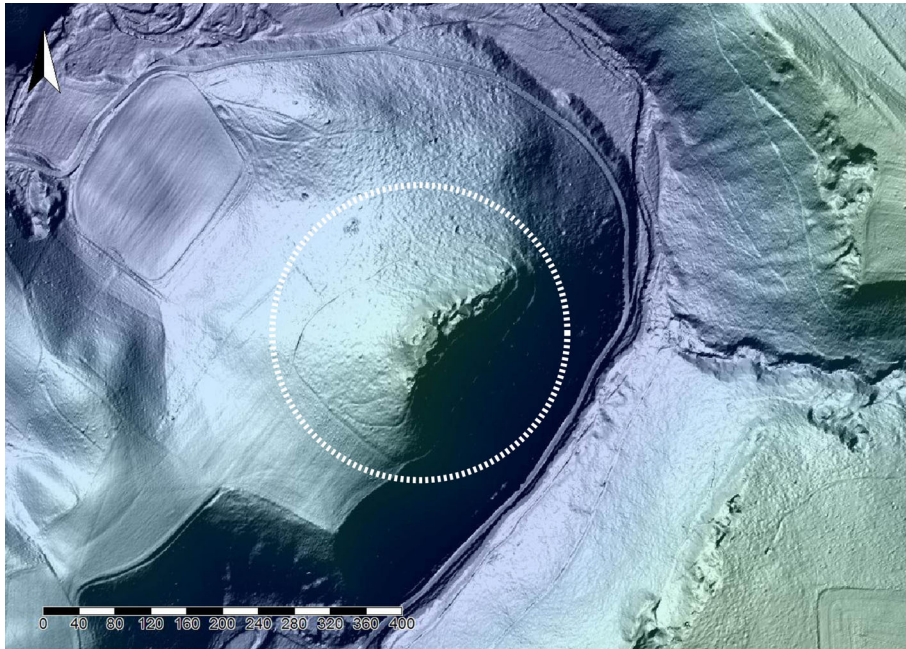
**Fig. 18** ab. Dębowy Gaj, stan. 7, Lwówek Śląski county. Interpretation of the results of the gradiometer survey (yellow) and satellite images (red). (Prepared by M. Furmanek)

During the DEM analysis of the chosen area, a few abandoned manors were also discovered. *Messtischblätter* maps (1880–1940) indicate that they were still functioning in the first half of the twentieth century. Besides, building relics located north of Ostrzyca hill seem to be significant for the future studies.

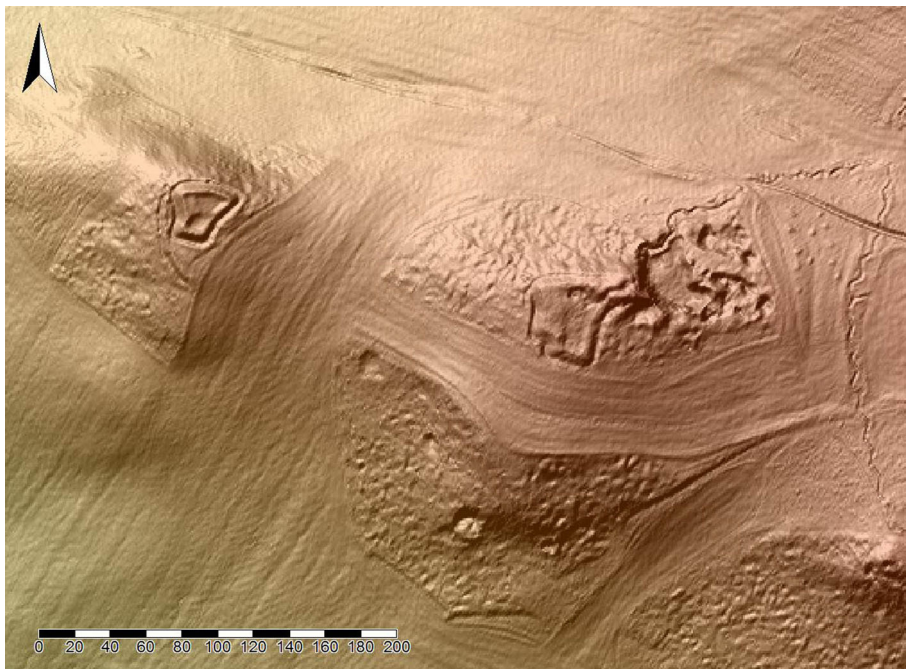
## Border Stones in the Area of Wleń

From the beginning of the thirteenth century, in Central-Eastern Europe, and therefore in the region subjected to the survey, we can clearly observe a need to mark borders (Kiersnowski 1960; Kaźmierczyk 1978; Kaźmierczyk and Jaworski 1991; Legut 2008, pp. 203–218). The need resulted from the progressing process of abolishment of the state monopoly in land ownership. It was manifested by allocating land to church institutions and to the chivalry, foundation of towns and villages based on new rules of law, as well as land trade. The areas directly surrounding the castle and the town of





**Fig. 19** Nielesno, Góra Grodowa, the DEM. Prepared by M. Legut-Pintal



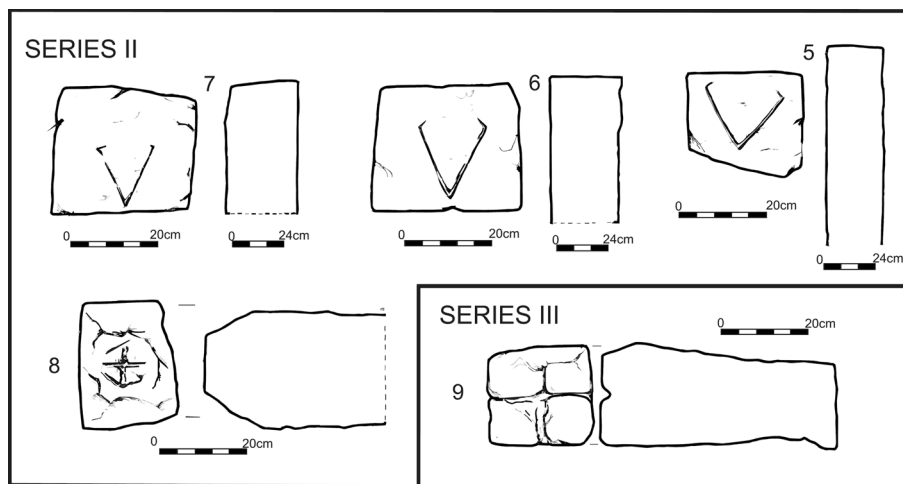
**Fig. 20** Oleszna Podgórska, stan. 8 and 9. Fortifications at the top of the Skalnik hill, the DEM. (Prepared by M. Legut-Pintal)

Wleń can be considered unique due to the fact that its border markers have been preserved until the present day. The first discovery of a border stone between the castle and the town of Wleń was made in 1936 by Fritz Geschwendt, and a commentary on it was published by Max Hellmich (1937). He suggested that the border in question was the one between the town and the castle grounds. A broader search for further markers was conducted twice, in the 1980s and in the years 2013–14, and 47 border stones were documented in total. The starting point for their analysis were the findings of Cezary Buśko (1991), published after the discoveries in 1986. The present study was aimed at establishing a chronological stratification of separate series of border markers and reconstructing the border lines. An analysis of the range of visibility of the markers was conducted based on the abilities of GIS.

Cezary Buśko divided 19 artifacts that he recognized into four groups of border stones. The first group included stones with the letter “V” carved on the frontal surface, which was associated with the original name of the castle - *Valan* (Fig. 21). They were considered to be the oldest of the stone markers that replaced the earlier form, that is stone mounds made of small stone chips. C. Buśko dated them to the first half of the thirteenth century and linked them to *ujazd* (marking the borders of a property) performed by Silesian duke Henry I the Bearded (Buśko 1991, p. 116).

The second group consisted of the stones discovered on the eastern slope of Góra Zamkowa, between the castle and the town. Their main feature was a deeply carved sign of the cross on the frontal surface dividing it into four fields. Their creation could have resulted from the need to separate castle lands from the town which was founded before 1261 (Fig. 22).

The third group consists of two types: a and b. Their common feature was a carved sign of the cross, and they differed in the kind of stone used, as well as in the precision of stonework. Less carefully worked stones were found in group IIIa, while stones from group IIIb were carefully worked into the form of a cuboid. Buśko dated them to the turn of the Middle Ages and the modern era. The border marked by them ran along characteristic elements of the topography.



**Fig. 21** Examples of the border stones from groups II and III. Numbering consistent with that in Fig. 23. (Prepared by the authors after Buśko 1991)





**Fig. 22** Wleń. One of the border stones (series III) in its original localization. (Photo by A. Łuczak)

The last group IV was divided into two types: a and b. It consisted of cuboid stone blocks with the Maltese cross carved on their frontal surface, where group IVa is characterized by a less careful treatment of the stone and carving of the cross. The stones from group IVb show signs of mechanical working. Their placement does not correlate with specific topographical features. The way they were worked, as well as their placement are linked to the cadastre measurements conducted from the first half of the nineteenth century. The basic insufficiency of the classification suggested by Buśko is the lack of clear foundations for dating of particular types of the border stones.

The results of the research conducted in the years 2013–14 were aimed at verifying and complementing the earlier findings. The discoveries included: further groups of border mounds (two rows and one destroyed mound next to a border marker), three stones with the sign of the Maltese cross, one stone with a carved contour of a triangle and a group of four border markers carved on natural rocks. Their location was presented in consideration with the borders of territorial divisions. Thanks to the new finds, the typological division was updated and directed towards reconstruction of forms of marking and the shape of borders.

- I. Circular border mounds made of small stone chips. No clear basis for dating.
- II. Stones with carved letter “V,” according to Buśko dating to the first half of the thirteenth century.
- III. Stones with a carved sign of the cross dividing the frontal surface into four fields, according to Buśko dating to the thirteenth century.
- IV. Natural rocks with a sign of the cross carved 2–4 cm into the rock – they might come from the same period as the stones in group III.
- V. Divided into subgroups a and b (groups IIIa and IIIb according to Buśko), dating to the turn of the Middle ages and the modern era: a – stones with a carved sign of the

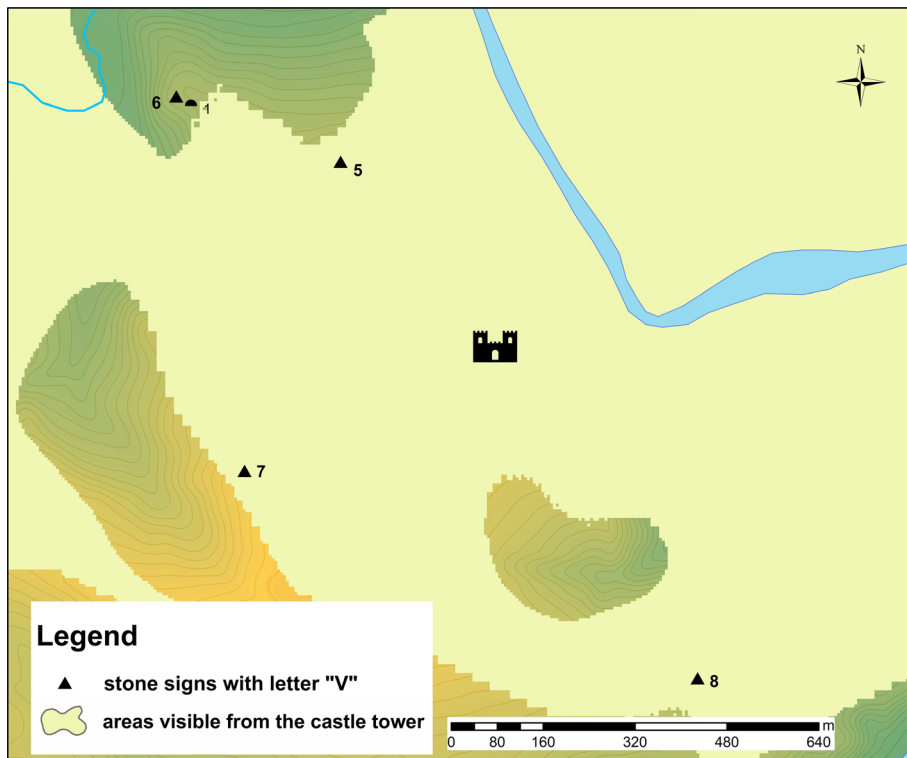
cross, with carelessly worked surfaces, b – stones with a carved sign of the cross with carefully worked surfaces.

- VI. Stones with a carved sign of the cross, whose arms of approximately equal length. Divided into two subgroups, dated similarly to group V: a – carelessly worked surfaces and irregular shape of the frontal surface, b – carefully worked stones with an elongated, rectangular shape of the frontal surface.
- VII. Rectangular stone pillars, referred to by Buško as group IV, dating to the nineteenth century: a – stones with a sign of the Maltese cross carved in the frontal surface, with careless working of the stone and the cross, b – stones with the Maltese cross carved on the frontal surface, carefully worked surfaces and the cross, c- stones with a mechanically carved sign of the cross on the frontal surface.
- VIII. A stone in the shape of a cuboid with a hand-carved contour of a triangle on the frontal surface. Its position on the line amongst signs from groups V and VI, dated back to the turn of the Middle Ages and the Modern Era, constitutes a clue to its dating.

Dating remains the greatest difficulty in the analysis of border markers. The lack of precise criteria causes that in many cases dating remains either unsure or very general.

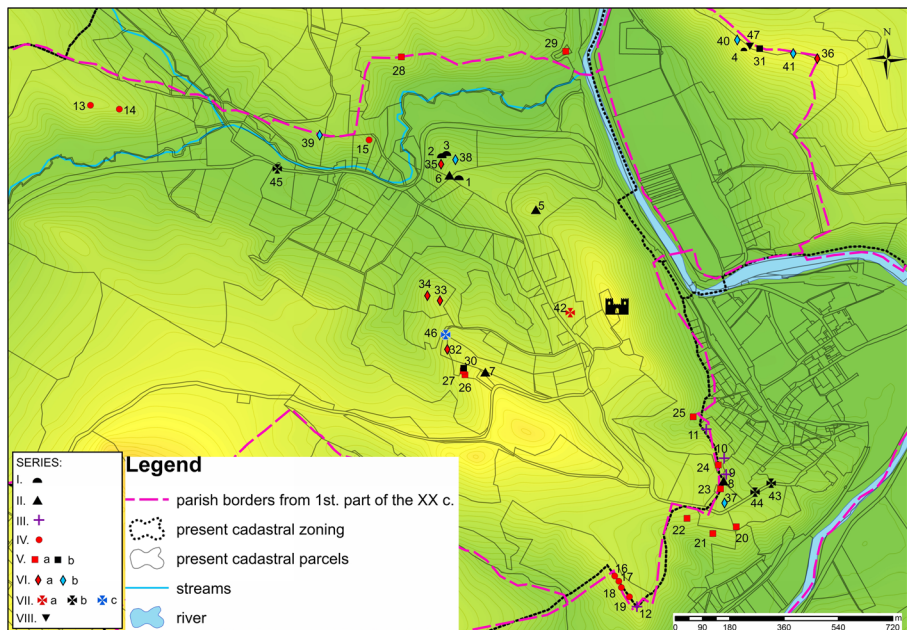
Taking into account Buško's (1991, p. 101) suggestion about the potential significance of the visibility range when establishing the placement of stones from group II (group I according to Buško), an analysis using GIS software was performed. The visibility range from the castle tower in Wleń was considered. It was assumed that the original height of the tower vantage point was originally about 22 m. The result obtained suggests that all places where the markers from group II with the letter "V" carved on them – except marker no. 6 – might have been visible from the castle tower, with the assumption that the area was not covered with trees. The question whether the mentioned stones from group II were placed based on their mutual visibility was also posed. In order to verify this hypothesis, the visibility range for every stone in group II was calculated, with the presumption that the height of the observer was 1.65 m on average, and the field of view was not obscured by vegetation. The results obtained confirmed that from the location of stone no. 5 it was possible to see the castle and the place where the stone no. 7 was located. From the location of stone no. 6 the field of view covered both stones no. 5 and 7, as well as the castle. Further, the field of view from where stone 7 was placed covered stones 5, 6 and the castle. The field of view stretching from the location of stone no. 8 differs, because it covered only the nearest border markers located on the side of the hill together with the stone in question (Fig. 23). Therefore, Buško's suggestion that the mutual visibility of consecutive markers, as well as the field of view from the castle, might have had a great significance when marking borders.

The placement of the discovered stones allows an attempt to partially reconstruct the outline of the local borders (Fig. 24). Based on comparisons of the placement of border markers with the outline of historical borders of counties and the present borders of the land records area and the borders of the cadastre division, it can be noticed that most of the discovered border markers were placed on slopes and edges of elevations and promontories, that is in places of characteristic topographic points facilitating identification of the border.



**Fig. 23** Wleń. Visibility range of border stones perceived from the castle tower. (Prepared by A. Łuczak)

In contrast, the stones with the sign of the Maltese cross (type VII, markers no. 43, 44, 45, 46; no. 42 had been secondarily moved) are placed exactly within the area of the cadaster plots marking out the borders. A similar function (of cadaster division markers) could have also been performed by certain markers of type V (especially stones no. 26, 27, 30, 31), in the case of which the placement is consistent to a major degree with the outlines of the cadaster plots. It should be stressed here that we do not have any other comparison material except for the information on plot borders. A similar function could have been performed by markers no. 20–21 of type V, but no information exists regarding the border of the cadaster plot that might have existed there. Among the discovered series of markers, only two correspond both to the historical border of the county as well as the contemporary border of the lands record area. They are located north of the town of Wleń (markers 4, 31, 36, 40, 41, 47) and to the southeast of the town (markers 12, 16, 17, 18, 19). Interestingly, only the last of the mentioned series is relatively uniform in terms of the type (IV) of used markers (except for marker no. 12). Another prominent example is a group of markers separating the castle property from the town grounds. The border was established on a side of a hill (markers no. 8, 9–11, 23–25); to the southwest from the town of Wleń. If we presume a chronological order of creation of markers of types from II do V, then we may put forward the assumption that the border had been a long functioning one and it required renovation and confirmation of its line, and therefore – placing further markers. It is also suggested by the recarving of the letter “V” into a cross on marker no. 8 from type



**Fig. 24** Wleń. Location of historical border stones in contrast to the twentieth-century borders. (Prepared by A. Łuczak)

II. The last, and at the same time the most complicated, is the issue of placement and function of the markers of type I and II. So far only four stones with the letter “V” carved on the frontal surface belonging to type I have been discovered, which, according to Buśko, should be linked to the property’s border marking (*ujazd*) or renewing of the borders by duke Henry I the Bearded between the years 1202 and 1238 (Buśko 1991, pp. 115–116).

A considerable distance between the markers does not allow us to determine a precise line of the border, while connecting markers with a straight line creates an irregular polygon within the limits of which the castle is located. The connection of those markers with the castle is confirmed by the visibility analyses presented earlier. The occurrence of stone mounds in the vicinity of other markers (especially the ones observed near the sign no. 6 of type II) suggests that they might have constituted an older form of border marking, that is they could have been created during the first *ujazd* of the castle land (before 1202), while renewing the borders (years 1202–38) might have concerned specifically the type II markers, as suggested by Buśko (1991, p. 116).

## Road Development in Wleń District

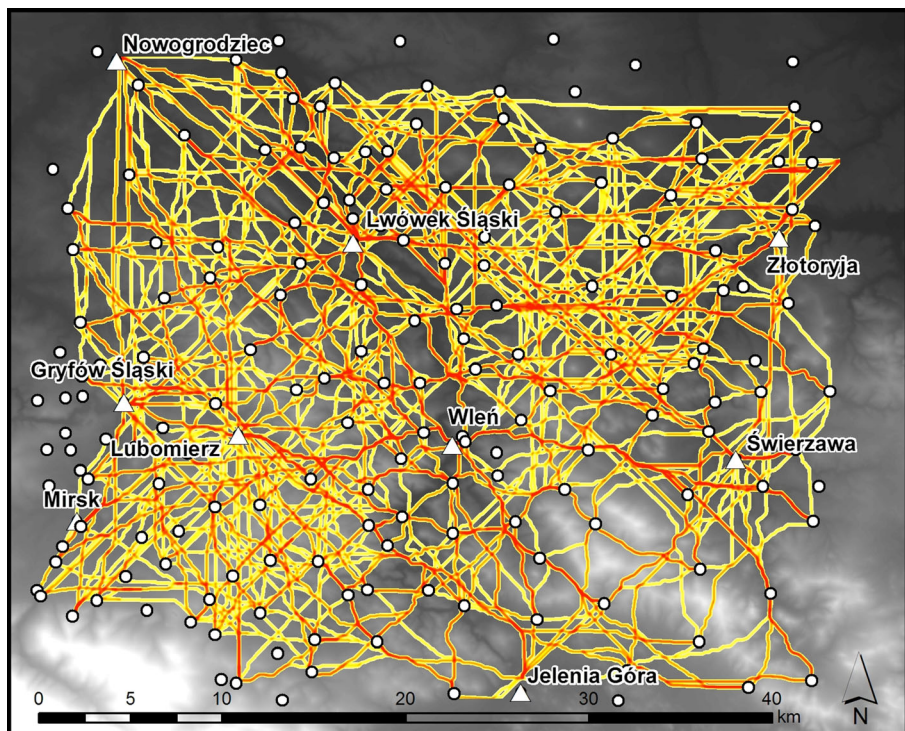
According to the earlier finds of Janina Nowakowa (1951), based upon written and cartographic sources, medieval Wleń remained beyond the main routes running through bigger, neighboring towns of Lwówek and Jelenia Góra. Therefore, the aim of our analysis was a model reconstruction of the line of local roads within Wleń district from the Middle Ages until the late modern era. In terms of methodology, it was



based on the abilities of GIS tools. It concerns mainly cost distance analysis, based on an algorithm calculating the shortest path, considering an accumulated cost of travelling between selected cells, using the information on the terrain contained in the DEM. Amongst many algorithms available in GIS software, we chose the one based on Tobler hiking function (Conolly, pp. 234–262; Ejstrud 2005; Tobler 1993).

In the first part, the roads between eight major medieval towns located in the vicinity of Wleń district and within its territory, that is between major towns were calculated. Separate calculations were made for each town, and the destination points were 139 location points from Wleń district and its neighborhood. As a result, eight raster models were obtained, which illustrated the shortest routes between those locations. In order to establish, which of the obtained route models and their parts appeared most frequently a density map of paths was created. To verify the road models obtained with GIS software, historic cartographic sources were used. All the maps had been subjected to the processes of georeferencing and rectification.

Analyzing the road routes thus created, it can be noticed that the algorithm used to create the least cost paths directed them along the valley of the Bóbr river, as well as across valleys of smaller watercourses, that is in places where the terrain goes slightly downwards (Fig. 25). The methods used also allowed to show the roads, which were determined by the algorithm multiple times (between different points), thus suggesting that a particular road or its part was optimal in terms of the cost of hiking effort. The



**Fig. 25** Reconstruction of the road network in Wleń district depicted using a density model based on the frequency of the modeled road with the radius of 150 m; darker color indicates higher frequency. (Prepared by A. Łuczak)

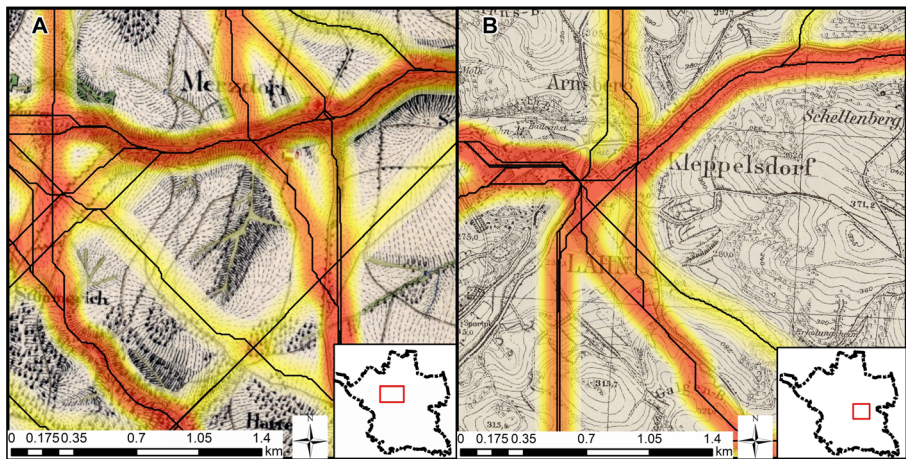
selected sections of the reconstructed roads were then compared with the roads shown on archival maps from different periods. On the Wieland-Schubarth's map from 1736 (Princip. Silesiae Iavoriensis 1736) only some of the roads are present and they are significantly simplified, conveying only their symbolical shape and direction. The existence of remaining roads can be presumed from the setting of village buildings along watercourses. Taking into account a small scale of this map (above 1:100 000) and its lack of accuracy, it is difficult to reconstruct the road routes upon it. Despite this, certain similarities in the routes of modeled roads and the density range marked by them, running along valleys and downward slopes, can be noticed.

Certain simplifications can be also seen in Christian Friedrich von Wrede's medium scale maps from the years 1747–53 (von Schlesien 1747–53, Kart N 15 060) and Ludwik Wilhelm Regler's maps from 1764 to 1770 (Schlesien 1764–70, Kart N 15 140). Especially C. F. von Wrede's maps show very symbolical road depictions, forms of which refer to the road depictions from the Wieland-Schubarth's map (1736). Due to its inaccuracy it is not reliable as a source for establishing a detailed reconstruction of road routes. In Regler's maps, the roads are presented somewhat differently. The author, contrary to his predecessors, marked out all the roads known to him, even the ones leading to fields, which testifies the dutifulness of the executed field image. Neither is this map a cartographic one, which makes the reconstruction of the roads possible only through identifying and marking the depicted roads onto the roads that appear on later maps. Despite this, the road models, and especially the density area created based on them (which can be treated as a sort of a buffering zone marking the error margin of the position of the modeled roads) concurs partially with the lines that the roads on Wrede's and Regler's maps followed.

More details and a greater accuracy of field measurements can be seen on nineteenth- and twentieth - century maps. The nineteenth - century maps, despite measurements based on triangulation used to create them, also are not fully accurate. The roads marked on these maps are characterized by significant errors of distance measurements and at times their drawing resembles the roads known from eighteenth - century maps. The twentieth - century maps, however, are fully accurate and the elements shown in them were measured with the accuracy and detailedness appropriate for the scale of 1:25 000. The lines along the modeled roads run, along with the related to them density range, in comparison to the roads shown on the nineteenth- and twentieth - century maps, show a lot of similarities. The comparison of the modeled road with the road going from Wleń through Marczów village in the direction of villages Chałupki and Przeździec can serve as evidence. The road almost concurs with the road shown on the map (Fig. 26a). Similarly in the case of the road from Wleń towards Bystrzyca village, where the reconstruction is almost identical to the pedestrian road depicted on the map as a dotted line.

## Penal Law Relics

Relics of instruments for executing law, including execution sites, constitute an important element of the medieval and modern cultural landscape. Their disappearance dates back as late as the first half of the nineteenth century. Due to legal changes and Enlightenment trends, execution places and gallows became symbols of the old order, which was negatively perceived by the contemporary elites. The process of systematic



**Fig. 26** Comparison of the reconstructed roads and the ones depicted in cartographic sources. Black lines – the reconstructed road; (a) – the area of Marczów village in contrast to Urnesstischblätter (sygn. 2883, Liebenthal) from the first half of the nineteenth century (1824), (b) – the area of the town of Wleń and the road leading in the direction of Bystrzyca in contrast to Messtischblätter (sygn. 4960, Lahn) from the first half of the twentieth century (1939). (Prepared by A. Łuczak)

dismantling of masonry gallows lead to nearly complete destruction of devices of such type. In Lower Silesia relics of a few of them remain, for example in Wojcieszów, Miłków and Złotniki Lubańskie (Wojtucki 2009, pp. 239–257). Others are known from written and cartographic sources. They were scrupulously marked on maps and treated as important landmarks, for example for the army. Similarly, in the case of maps published in the times when gallows had already been gone their preserved walls, as well as those in ruins, were consequently marked. Place names, usually taking the form of Gallows Hill (*Galgenberg* in German) inform us about existence of execution sites that might have been equipped with wooden constructions. However, in the case when such a place had not been marked with an appropriate gallows symbol or we do not have written sources that could confirm its existence, we need to remain very careful.

Choosing a site for the execution square and the gallows, the visibility of the device was taken into consideration. It is known that similar constructions were purposefully constructed in exaggerated proportions, thus emphasizing their preventive character. Usually well visible elevations were chosen. In the case of their lack, the gallows were located by the main road leading to the settlement. It can be sometimes noticed that the execution site was not positioned on the top of an elevation but rather towards its edge. It is possible that other factors were considered when choosing the location. Also important were distance from the border, land ownership status, vegetation, and visibility. The situation was more complicated in smaller settlements. Not every village owner was able to afford to buy right of access to the supreme court. And only access to that kind of court gave the right to set up an execution site and construct gallows. Hence we might suspect that, apart from its preventive function, the gallows were also a form of manifesting one's wealth. This assumption gains significance if we realize that an investment of this kind was not only limited to the costs of the device itself, but was also related to many additional expenses – the labor cost of many craftsmen, an



appropriate celebratory feast, fees for the hangman for receipt of the device etc. As an example, we can examine the case of the town of Halle, where, in 1534, when the town council knew that a cardinal was to visit the place, it was decided to change the wooden gallows for a masonry one. The idea was then abandoned due to the lack of sufficient funds (Trzeciński 2001, p. 187).

In the area of Wleń *Weichbild*, the location of several such devices has been confirmed. A masonry gallows existed in the vicinity of Wleń, on a hill located to the south-west of the town. It was marked on a veduta dating to the end of the eighteenth century (Wojtucki 2009, p. 552). The land around the town, at least in the design, was free of trees. The author of the design depicted a circular masonry structure, with an entrance from the town's side and three pillars on top of the crown of the gallows well. The pillars are missing wooden beams, therefore the device might have been no longer maintained and was falling into ruin. Across the execution site, marked with a symbol, there is a gallows located on the territory belonging to the village of Modrzewie (Wojtucki 2009, p. 541). Another gallows could be found in a clearing, to the south of the road connecting villages Maciejowiec and Chmieleń. Another one was located on the edge of present day Szybowcowa Mountain, on a plot located to the northwest of Dziwiszów, and to the northeast of Jeżów Sudecki. On the plans that are available to us (syg. 15060, Bd. 1, Karte 9), the masonry gallows located to the south of Sobota village seems to be an interesting object. On the plan from the years 1747–53 the construction is marked to the west of the road (von Schlesien 1747–53). On a younger plan (*Urmesstischblatt* Kart N 729, Blatt 2884) the gallows symbol is no longer present, which might indicate that the device was dismantled after this date. In its place, or close to this location, a gravel pit appears. The memory of the place, however, was preserved in the name of the hill – *Galgenberg*. We can notice that the area thus named on the map is considerably larger than the original execution site. Moving further south along the route leading to Grzęby village we encounter another gallows, which was probably located on the land belonging to this settlement, to the west of the road.

During the field survey, we succeeded in finding and then excavating the execution site in Modrzewie. The local gallows was erected on a clearly visible elevation, the height of which was 292 m above the sea level. Its partially preserved relics indicate that the foundations of worked stones were 30 cm deep. They were joined by mortar containing a small amount of lime. The breadth of the foundations was between 85 and 88 cm. The outer diameter of the gallows was 6.3 m, while the inner was 4.5 m (Fig. 27). Within its limit, unarticulated human bones were discovered. The dimensions of the surveyed gallows, erected by the village, correspond with typically urban constructions. They are comparable to objects registered in Kamienna Góra and Jelenia Góra, the nearby towns outside of Wleń district. Therefore, we can speculate to the extent the construction was meant as a form of executing justice, and to what extent it was a statement of wealth of the landlord.

A separate category includes locations marked on maps that in the past could have served as execution sites. Not every hill referred to as *Galgenberg* functioned as an execution site. In other cases, the name related to the original execution site might have changed. Wzgórze Szubieniczne (Gallows Hill), partly covered with trees, can be found south of Maciejowiec village (*Urmesstischblatt* Karte N 729, Blatt 2946). The hill was visible from the village itself, as well as from the neighboring village of Pokrzywnik.



**Fig. 27** Modrzewie. Excavated remains of the gallows. (Photo by P. Duma)

Perhaps this is a case of shifting a name of a former execution site to a hill with no such history. As stated earlier, on an older plan of the area (N 15060, Bd. 1, Karte 8), the gallows is located in a clearing situated to the west of the village. Moving south, another hill named *Galgenberg*, is located on the land belonging to Rybnica village. Interestingly, to the northwest from the elevation there is a terrain dip called *Galgenbergsacke* (*Urmessstischblatt* Karte N 729, Blatt 2946). This area is presently covered with a dense forest, while the map shows that in the past it was largely cultivated.

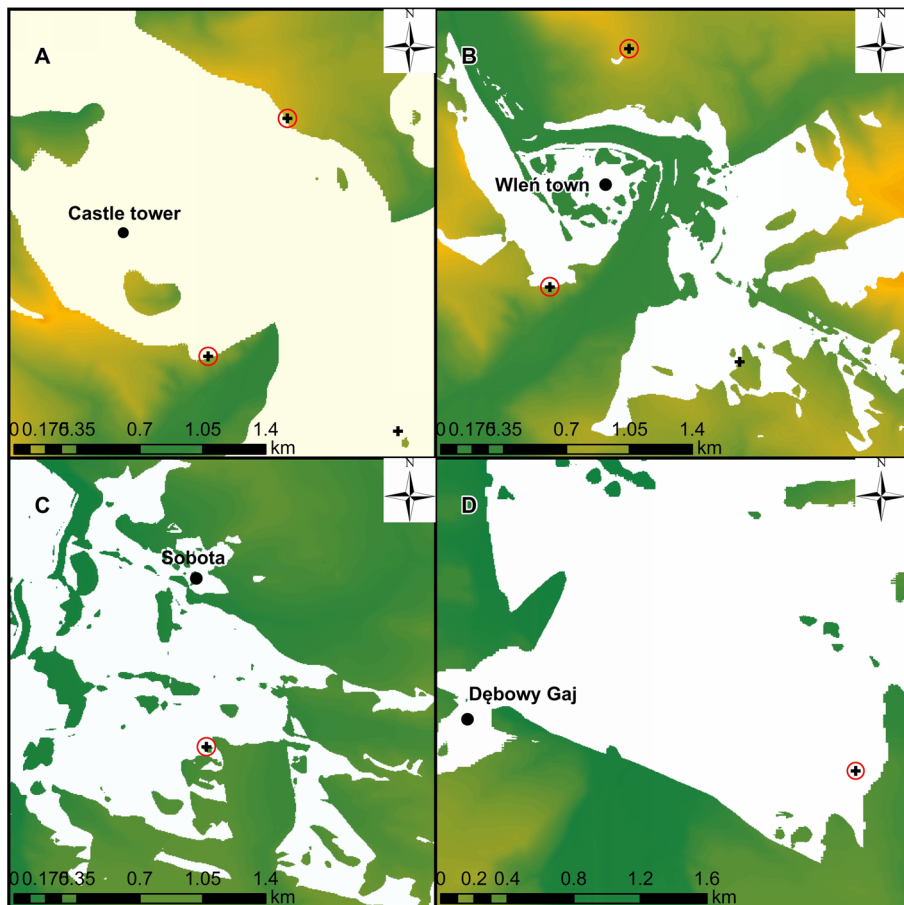
The following factors were usually taken into consideration when choosing an execution site: good visibility from the neighboring settlements, fortified settlements or roads, as well as the distance from them. The position in relation to the administrative borders might have also been significant. Such information are usually formulated as casual and subjective statements, at times not validated by any empirical evidence (eg Wojtucki 2009, pp. 59–69). The main problem in recognizing and verifying such opinions is the issue of the exact locations of the mentioned penitentiary devices. Unfortunately, exact location of many gallows is unknown and their placement is indicated only by inaccurate maps from the eighteenth and nineteenth centuries. Only few gallows relics have been located and they are the only basis on which further analyses of their relation to other elements of the cultural landscape can be conducted. In the area of Wleń *Weichbild* only one gallows in Modrzewie was located and surveyed archeologically, while the remaining ones are known only from cartographic sources. Therefore, the present analysis will be based mostly on uncertain locations of gallows. The results should be treated with caution and their hypothetical character taken into account. The attempts presented here are based on the visibility analysis and distance measurements.

Numerous research results cover the analysis itself, the theoretical foundations, the use and usability in archaeological survey (see e.g., Conolly and Lake 2006, pp. 225–233; Van Leusen 2002, 6, pp. 1–3, 9–14), and repeating this topic is beyond the scope of this paper. Due to a particularly time-consuming calculation process, only a few vantage points that might have been significant were selected for the purpose of visibility analysis. The average height of the observer taken into account in calculations was 1.65 m. In the case of the castle tower in Wleń, the height was established at 22 m, that is the approximate height of the tower before it was destroyed (about 10–21 m) plus the observer's height (1.65 m). Following the optimal distance of human visibility range and the computational power of GRASS GIS software, a range of 4–10 km from the observer was established. The second type of performed analysis included distance measurements and it considered: 1 – the distance from the nearest settlements, 2 – the distance from roads, 3 – the distance from borders of territorial units. It should be stressed here that the considered roads were reconstructed using of archival maps and the road lines established on the basis of Cost Distance Analysis. The territorial units borders (country borders) were based on maps from the first half of the twentieth century. Research on border stones supported with field and source verification suggests they functioned when the gallows still existed.

The first of the analyzed vantage points, for which the visible area was calculated, was the castle tower (Fig. 28a). Assuming that the original height of the tower was 22 m it can be speculated that significant location points of the town gallows in Wleń, as well as the village gallows in Modrzewie, could have been visible. If we consider the assumed range of uncertainty (the buffering zone with its 50 m radius) for the location of the gallows in Grzęba village then the visible area is within the range and most likely the gallows could have been observed from the tower. A similar result was obtained for the center of Wleń (Fig. 28b), from the vantage point in Gościradz village, where the gallows near Grzęby village most likely was not visible from that place. An identical result was obtained for the selected vantage point in Grzęba village where Modrzewie and Wleń gallows were within the visibility range, while the nearby gallows was not. A negative result was obtained for the calculations of visibility areas for Tarczyn and Nielestna villages, from which none of the mentioned gallows was visible. Interesting results were obtained for the gallows by the road leading from Górzycza to Sobota. From the point of view of an observer standing in the centers of villages Sobota and Dębowy Gaj (Fig. 28c, d) it was possible to observe the nearby execution site, invisible from the direction of Górzycza village.

Another element of the conducted visibility analysis was an attempt at establishing whether the visibility range of the prospective gallows location was taken into consideration when the gallows construction site was selected. In order to answer this question, the visibility range from three gallows sites located around the town of Wleń was calculated (Table 2), with the assumption that no obstacles interrupted the observation. The results obtained inform us that from where each of the gallows was located the other ones could have been visible, even if we consider the buffering zone with the range of 50 m for gallows with a similar location. The gallows near Grzęba village, assuming that it had been located by us correctly, was the least visible.

The shortest distance from the gallows to the closest settlements, reconstructed roads, and borders of territorial units was measured. Based on the results, with the assumptive error margin for the gallows, location of which could not be identified



**Fig. 28** Visibility analysis of gallows. (Prepared by A. Łuczak)

accurately, it can be noticed that the gallows in Modrzewie was the farthest from the nearest settlement (over 1 km away) as well as from the administrative borders, but it was the closest to the road going from Wleń to Jelenia Góra. The town gallows in Wleń, on the other hand, was the closest to the administrative borders ( $136 \text{ m} \pm 50 \text{ m}$ ), but it was remote from the reconstructed road from Wleń to Lubomierz ( $349 \text{ m} \pm 50 \text{ m}$ ). It is known, however, that the old road from Wleń to the castle runs by that gallows,

**Table 2** Summary information about the observation points at locations of gallows

Gallows	X coordinates	Y coordinates	Distance from observer point (m)	Observer height (m)
Wleń	266494.1987310	354673.2265800	5000	1.65
Modrzewie	267551.0938980	354256.1620890	5000	1.65
Grzęby	266935.7071165	355998.5855220	5000	1.65



which could have constituted a factor more important than the road to Lubomierz. The gallows by Grzęby village was located at a certain distance from the reconstructed road to Sobota village, but even based on the map from the years 1747–53 (Krieges Karte von Schlesien) it can be noticed that it might have in fact been located farther from that road. The distance between the mentioned gallows and the nearest settlement was smaller compared to other gallows. The last of the analyzed gallows was located relatively close to the administrative borders and the road (190–195 m  $\pm$  50 m), but it was considerably more remote from the nearest settlement than in the case of the gallows in Wleń and Modrzewie.

In order to sum up the following analysis attempt, it can be stated that the visibility range both from the execution sites and from the neighboring elements of cultural landscape could have had a great influence on the location of gallows. Perhaps mutual visibility of those devices was also a decisive factor, at least in the case of Wleń and the neighboring villages. When choosing the execution site, not only the visibility from the place to which the gallows belonged was important. The broad exhibitory qualities of the gallows were also considered. Assuming that the analyzed area was far more deforested than presently, based on the presented simulations we can presume that the observer could have been able to see the silhouette of the gallows from many vantage points. The founders of the constructions likely believed in their preventive qualities. The research on the relations between the factors proposed here, such as roads, borders or settlements, are a complicated problem, but with a precisely located execution site (Modrzewie) complemented by a survey (the lines of the former borders), certain choices of locations become clear, while in other cases they have a more disputable and unsure character.

## Conclusion

The research of settlement structures has a long tradition in Central Europe, and its methodological conception is based on experiences summarized in the 1970s by Herbert Jankuhn (1977). The compendium concerned mostly monodisciplinary archeological surveys, focusing on prehistory and the early Middle Ages. Later periods that used to be studied mainly by historians or architectural historians were referred to as *melioratio terrae nostrae*, or German *Landesausbau* (Böhme 1991; Münch 1965). The concept of cultural landscape analysis provides greater opportunities for observing past reality (e.g., Ashmore and Knapp 1999; Aston 1985; Hoskins 1969). The authors accept the methodological approach presented in those works, especially the topics of settlement development, economy, lifestyle and related social regulations, and ideology and symbolism. The authors are also aware of the importance of environmental conditioning – adaptation, exploitation, and anthropogenic changes to the environment. The modern concept of cultural landscape reminds us that the results of archeological research cannot be meaningful without being placed in the proper geographic and historical contexts.

Modifying the research strategy and applying new methods changed our knowledge of Wleń as a central place and the area of its influence in the pre-industrial era. The results of the study indicate that the development of the cultural landscape in the surveyed area was a compromise between natural

conditions and anthropogenic factors – settlements and fortification, land ownership, and social stratification.

The term “microregion Wleń” in a way automatically implies that the borders of the surveyed area together with structures located within them do not take the shape of a line. The area range distinguished as a stronghold district, castellany, *Weichbild* or district, depending on chronological changes, is rather the subject of the analysis. The central point of the microregion, in its functional understanding in accordance to Cristaller’s (1933) theory was the stronghold and later the castle on Góra Zamkowa. The area on which the administrative, military, and economic influence of the castle extended was located on a hill by the Bóbr River. Its cultural structure was shaped by many complicated settlement processes that took place in an area where political domination of Poland, the Czech state, Germany, and smaller demesnes bordered.

We do not know if the medieval administrative units – the stronghold district and the castellany – had clear linear borders. The only certain information is that in the first decades of the thirteenth century Wleń castellany was surrounded from the north and the east by castellanies with strongholds in Bolesławiec, Legnica, and in Świny (Moździoch 2002, p. 190). More can be said about the range of the *Weichbild* formed in later decades of the thirteenth century, lasting until the end of the Middle Ages. Its principal area was determined by the feudal influence of the castle, and partially by the parish church of St. Nicolas in the town of Wleń. Written sources allow identification of villages belonging to the *Weichbild*. At the same time, we find information of advancing legal and economic changes, characteristic of so - called eastern colonization, or *Ostsiedlung*. Under the new plan, taxes traditionally paid in squirrel hides were paid in grain.

The progressive decline of the role of the castle and the increasing significance of the town can be observed beginning in the late Middle Ages. Nevertheless, the town did not withstand the economic competition that was raised by bigger neighboring towns – Jelenia Góra and Lwówek. It functioned as a local center, basing its coexistence on the nearby villages. The only protection from the north and the east was a meander of the Bóbr River.

The materials acquired during the research on the elements of the cultural landscape of the microregion Wleń resulted in creating the first interdisciplinary source database for a widely understood region, constituting a basis for studies on changes in the settlement network and its background in the pre-industrial era. These results, however, are not the final word. We hope that they will be the subject of debate and correction and that further research will permit comparisons with microregions that developed in other geographic and social environments.

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